GRINDING and FINISHING

FEBRUARY 1959

Russian Research in Fine Finish Grinding
How Good are Man-Made Diamonds?
Effects of Materials on Snagging Wheel Performance

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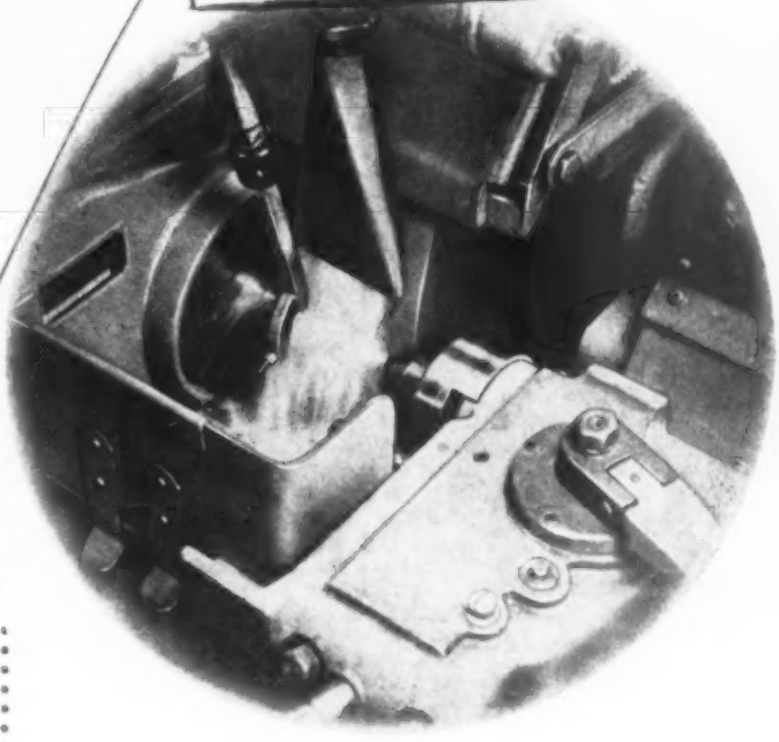

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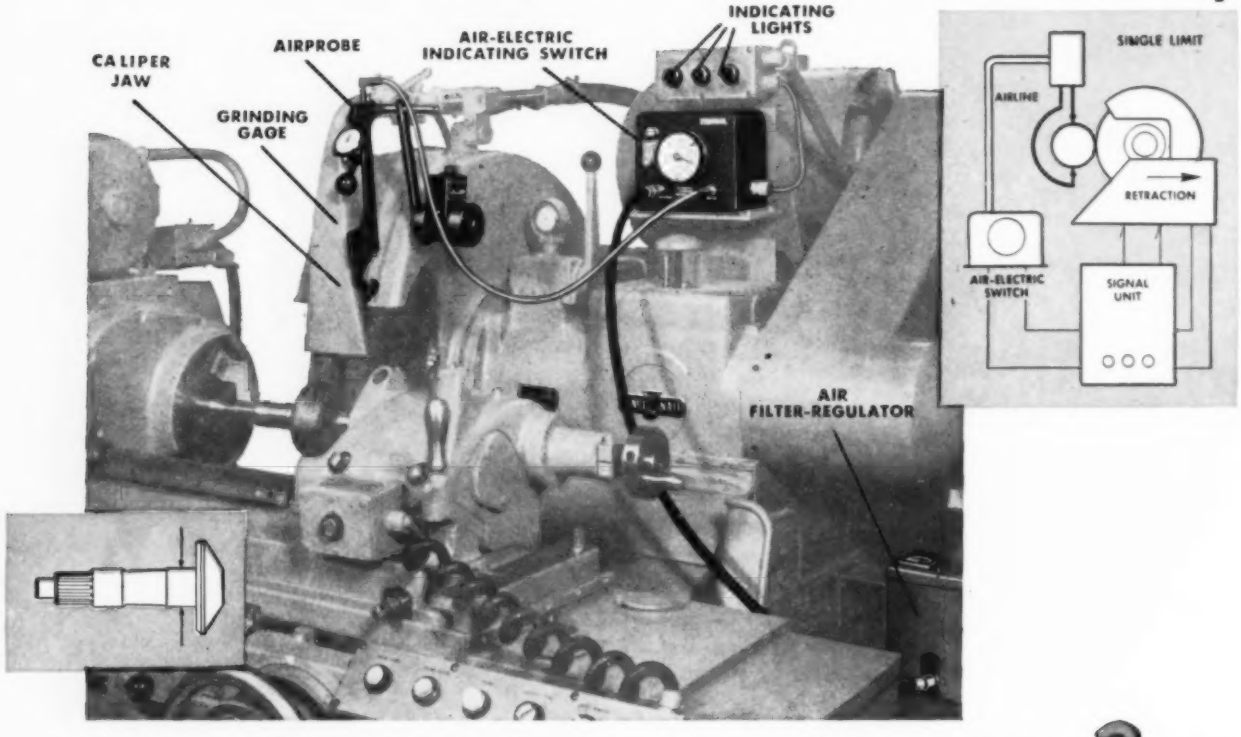

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	MEN	MACHINES	COST PER PIECE	PRODUCTION RATE (pieces per 8-hr. shift)
BEFORE			$.03585	1344
CONTROL GAGING INSTALLED				
AFTER			$.01526	1386

SAVINGS (per piece) . . . . . $.02059
RATE INCREASE (per shift) 42
TOTAL SAVINGS (per shift) $28.59
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WHEREVER ABRASIVES OPERATIONS ARE PERFORMED.

GRINDING and FINISHING

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FEBRUARY COVER: Cylindrical grinding, probably the oldest form of the process except tool sharpening, is the center around which Vic Erickson, our new editorial art director, has built a cover symbolic of the grinding and finishing field. The mounted wheels need no explanation. As to the abrasive-textured circles, they could be grinding wheels, coated discs, or scattered loose grain, while the rectangles could be honing stones, abrasive sticks, or workpieces of one kind or another. Take your pick.

NEXT MONTH: A control program for portable tools and an appraisal of the various forms of reinforcements for flaring cup wheels set the theme of the March issue. There's also a unique roll grinding story.

The Norton Measure of Value . . . the true measure of savings on materials you buy for your production is the cost-per-piece produced.

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You can produce greater savings than you can buy

The economic truth of the above statement applies to all manufacturing and is especially true in grinding wheels.

There are less expensive grinding wheels than Norton wheels — and on the invoice they may look like a bargain. But if the wheels purchased fail to perform efficiently on the production line or incur production delays because of poor quality or misapplication — a higher cost of production is the price actually paid.

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Letters

We would like to thank you for your interest in the A.I.T. Diamond Tool Company's findings on Electro-Assist and Electrolytic grinding that you have presented to your readers in the October, 1958 edition of GRINDING AND FINISHING. The facts introduced in your article have been repeated before many viewers that have visited A.I.T. from large industrial plants throughout the country. Our interest in inviting your editorial coverage of the electrical control units was to eliminate the mysteries surrounding the diamond wheels used with these units. During our tests and research program, we found that the diamond wheel was controlled by the factors which were reported in your article.

Upon reading the December issue of GRINDING AND FINISHING we noted the letter to the editor regarding this article. The text of this letter indicates that there are readers who may have misinterpreted the facts. With this in mind, we would emphasize that the article covered a test at A.I.T. Diamond Tool Company grinding one grade and size of carbide, with one particular voltage setting, one particular infeed pressure and with new coolant for each wheel.

By placing each diamond wheel under the same conditions the ability of the diamond wheel only is under test. To clarify the test results questioned in the letter to the editor, we would like to present the following comments on each paragraph:

We would like to state that 7½ volts was found by us to be the ideal voltage to use on Grade No. 350 Carboloy, ½ x ½" square as you stated in the article. 250 TO 270 AMPS IS EXCESSIVELY HIGH.

We note that the article clearly stated that 7½ volts was used for each make of wheel tested. The best A.I.T. wheel tested under these conditions showed a meter reading of 250 to 270 amps. It was found that the high amperage draw of this wheel removed carbide faster and finishes were equal if not superior to the lower amperage drawing wheels. In testing over 40 different diamond wheels the amperage varied from 150 amps to 270 amps.

As stated in the article, a 2½ gallon tank was used for the tests. A new batch of coolant was used for each diamond wheel tested. The charts on page 27 of the article show the advantage of the larger tank for production use. Chart No. 1 showed

a faster rate of stock removal when the 25 gallon tank was used than the same wheel could achieve in chart No. 2 when a 2½ gallon tank was used, thereby recommending the larger coolant tank for production which is usually supplied by the unit or machine manufacturer. The caption under the two charts stated "Diagrams showing the necessity for larger coolant tanks."

In the article it stated that a diamond wheel can be trued by deplating. It is known that an electrolytic wheel should be running true within .0005" for correct operation. In many cases in the field of diamond wheel users, a diamond wheel will be mounted and show a run-out of from .002 to .003". This run-out is usually caused by particles of sludge, or corrosion not cleaned from the back-plate before the diamond wheel was mounted. A small amount of run-out can be deplated by locking a piece of carbide in a position so that it will touch only the high spot of the wheel. This will remove the high spot of the wheel and will bring the wheel to the recommended trueness. Periodical deplating will also keep a continuous rate of production. The spacing of the diamonds between the bond and the carbide being ground will decrease as the wheel wears. This spacing is necessary for passage of the electrolyte (coolant) between the bond and the work piece. The required space gap can be acquired through deplating in a short time. As stated in the article "Depending on the condition of the wheel".

We agree with the writer of the letter to the editor, as to the overrun when the wheel oscillates beyond the work piece. The article stated that "Care should be taken not to exceed over ⅛" of the work off the diamond section." 1/32" would of course be a better limit if possible to hold.

The graphs contained in the article were not intended to establish a rate of stock removal, but rather as was clearly stated in the caption were to point out the necessity of a large coolant tank and the effect of coolant contamination.

We invite your readers to check these facts which you observed at our plant and subsequently reported. Due to the fact that all regular production setups for grinding carbide differ in problems and solving of same, the information from the A.I.T. laboratory tests or any laboratory tests should be used as a reference.

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GENERAL SALES MANAGER

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Longitudinal Travel	12-3/8"
Cross Feed Travel	7"
Vertical Working Height (Under 7" dia. wheel)	0" to 12-3/4"
Platen Working Area	6" x 12"
Grinding Wheel	7" x 1/2" x 1-1/4"
Elevator Handwheel Graduation	.0005
Cross Feed Handwheel Graduation	.001

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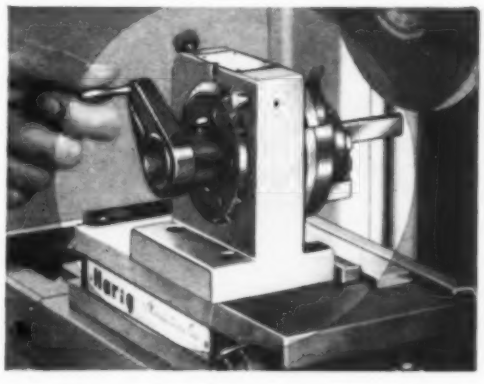

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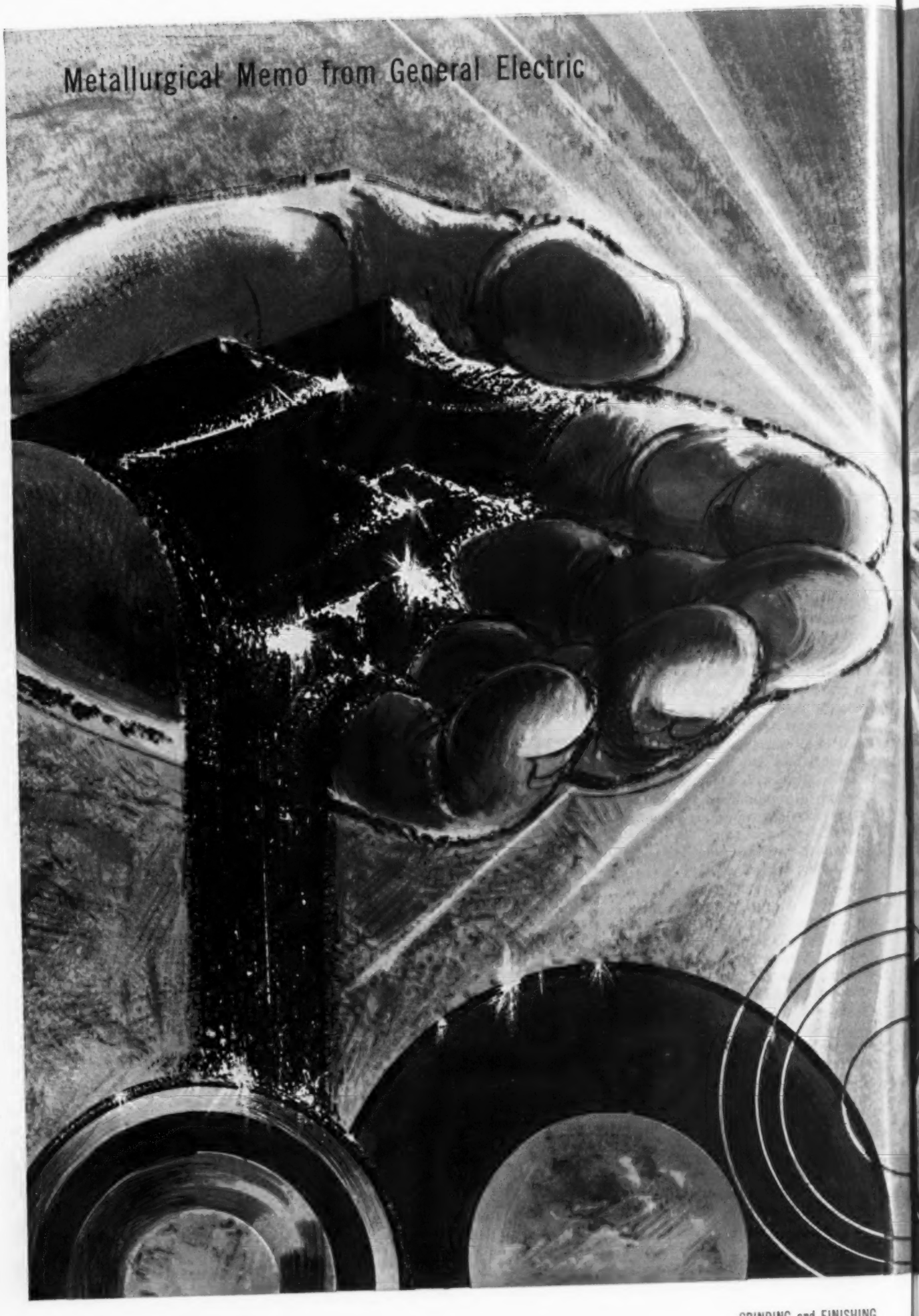
Metallurgical Memo from General Electric

How G-E man-made industrial diamonds improve on nature's best

They out-perform natural bort an average of 35% in carbide grinding . . . industry no longer has to depend on nature's supply of diamonds

Man-made diamonds are a reality.

They were developed and are being manufactured *in quantity* by General Electric. Already used in grinding wheels, they out-perform natural diamonds on most carbide grinding applications by an average of 35%. They produce equal or better surface finishes. They have effected substantial production savings . . . and they have *ended* reliance on nature's supply of diamonds.

General Electric man-made diamonds are better because, while their chemical properties are the same as those of natural diamonds, their crystal structure is importantly different. G-E man-made diamonds are more blocky and rough surfaced. This provides extra support in the bond—makes G-E man-made diamonds stay in the wheel until more completely used up—minimizes the waste of lost diamonds. They are also more friable, so that sharp new cutting faces are constantly presented, resulting in a freer cutting wheel throughout the grinding operation.

Wheels made with General Electric man-made diamonds are available now. They'll deliver a production bonus averaging 35%. Be sure *you* cash in on this superior performance by specifying wheels containing G-E man-made diamonds from your regular wheel supplier. *Metallurgical Products Department of General Electric Company, 11177 E. 8 Mile Ave., Detroit 32, Michigan.*

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SURFACE GRINDER

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- Steel roller anti-friction slides eliminate ball creep and increase rigidity.
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- Solid support through entire length of bearing quill assures extra fine finish.
- 5 inch table movement per turn of handwheel improves quality of finish and speeds up operations.
- No backlash, anti-friction ball nuts and screws on cross feed prevent wheel from creeping away from work in shoulder grinding.
- Swing-out stop for table dog contact permits quick movement to wheel dresser.
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Thompson SURFACE GRINDERS

Editor's Page

FEBRUARY 1959

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The Future May be Here

It's good therapy to sit back in our chairs occasionally and dream of what we think will be happening in the next five, ten, or fifteen years. If we were able to do this for sports, we could only think in terms of one variable—that being the ability of the players. As their skills improve, so do the accomplishments or records in the sporting event. The field of machining is not quite so well defined. Besides the operator there are a number of other variables. For single point machining there are maybe four or five types of materials and feeds and speeds which will affect the accomplishments. On the other hand if we conjure up the future of grinding and finishing operations we can be real free thinkers.

In sports we have well defined rules which, of course, if altered would affect the results. Single point machining operations are not as well defined but the number of variables do limit the achievements. Grinding and finishing operations with their infinite number of variables and combinations of abrasive composition alone—as compared to the four or five materials for single point tools—have unlimited possibilities. To further emphasize the possibilities of these operations—if we were to multiply out the variables for grinding and finishing operations the resultant figure would be difficult to place on one line of this page from margin to margin.

With these relationships in mind, we can dream or even predict the future achievements in sports and single point machining without much difficulty. When we dream of the potentialities of grinding and finishing, it is quite evident that we have just scratched the surface.

One very important word of caution—we should be careful not to find ourselves sitting back and dreaming about a grinding and finishing operation or achievement which may very well be a reality now. We have found time and time again, grinding and finishing operations which are standard in one company have not even been considered in another. This lack of consideration for solutions to your machining problems may be costing money. The tremendous number of combinations provided by the grinding and finishing variables makes it imperative that every metal removal operation be studied for the possible use of an abrasive.

M. M. Patterson

MANAGING EDITOR

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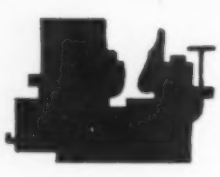

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And every time—time after time—when you reorder a CINCINNATI (PD) WHEEL, it will act and grind exactly like the original. The Positive Duplication of wheel grades by the remarkable (PD) manufacturing process *will help maintain your production*—and save you both time and money.

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Here's another advantage for you. Each one of our factory representatives is a highly trained and experienced specialist in grinding machine set-ups and operations. For his help on those extra-tough grinding problems, call your CINCINNATI (PD) GRINDING WHEEL distributor, or contact Cincinnati Milling Products Division, Cincinnati 9, Ohio.

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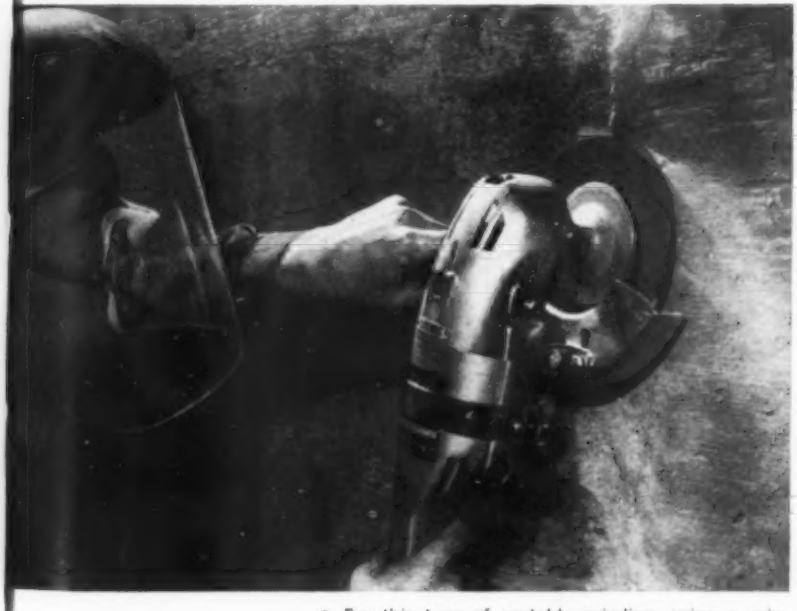
RICHARD L. McKEE • Associate Editor

Grinding w-EYES-ly

● The "eyes" have it in any safety program where abrasives are involved. Their protection is important at any time, but it becomes vital wherever grinding wheels, coated abrasives or loose abrasive grain are used.

The primary danger, of course, is that a piece of a grinding wheel or belt may somehow elude the guard and be propelled across the shop at high speed. When this happens, anyone in the line of flight could be in trouble, but the grinding operator, of course, is in the most critical spot.



● For this type of portable grinding, using a reinforced wheel, the face shield offers adequate protection. (Photo courtesy Bay State Abrasive Products Company).

Eye protection is so simple. Every grinding job has a specified type of safety glasses or face shield, which meets the requirements for safeguarding the operator's sight. Most companies furnish the equipment. All that an employee has to do is to wear it.

Much of the difficulty comes, of course, with employees who are using grinders only infrequently—sharpening an occasional tool on a bench grinder, for instance. If these are men whose normal work does not require goggles, it may be helpful to install an interlocking switch on the glass or plastic shield on the grinder (see GRINDING and FINISHING, November, 1958, p. 43), so that the grinder cannot be started with the guard out of position.

Another critical spot is in portable grinding, particularly when this is done only intermittently.

Production grinding operations are usually extremely well-guarded, but even in these the best practice is to wear eye protection. Many plants, in fact, require safety glasses for everyone who goes into grinding and other production areas, and this practice is to be highly recommended.

But whatever your plant or company rules may be, when you grind, GRIND W-EYES-LY. WEAR SAFETY GLASSES OR A FACE SHIELD. • • •

● A flexible mask goggle like the one illustrated above can frequently be used to advantage. This type fits over personal or safety glasses. (Photo courtesy American Optical Company).

STOP

uneven wheel action and costly stock removal

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Greater uniformity of grinding action – faster rates of stock removal – and consistently superior performance from job to job and from order to order! That's what V9, the new chemically designed glass bond, gives Simonds Electrolon (silicon carbide abrasive) vitrified bonded wheels for grinding gray iron castings, unannealed malleables, brass and bronze. Typical specification for floor stand snagging: C16-R-V9. Order from your Simonds distributor.

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(Advertisement)

Who's Responsible for Today's High Machine Tool Costs and Obsolescence?

By: **C. A. Wallace**
Manager
Filtration Division
U.S. Hoffman Machinery Corp.

A Hoffman Vac-80 Vacu-Matic Filter is shown installed on a Norton 30" diameter stepped-wheel grinder for grinding transmission shafts at the Syracuse plant of a large automotive manufacturer.

Under present competitive conditions, production and sales crises develop swiftly. That's why many manufacturers employing machine tools are taking steps to combat the twin problems of high costs and obsolescence.

Dirty Coolants Blamed

Grinding and finishing machines originally tested for performance with clean coolants can not function near rated capacity when the coolant contains metal chips, solid abrasives, grit, dirt and fine particles. Contaminated coolant is responsible for numerous hidden expenses including shorter tool and wheel life, frequent down time for wheel dressing, tool sharpening and sump tank cleaning. Dirty coolant also means higher labor and material costs, shorter useful life of oils and coolants, poorer product finish, excessive maintenance costs, poor working conditions and more rejects. Leading tool design engineers have proven that the metalworking industry stands to gain millions of dollars annually through the use of efficient filtration equipment

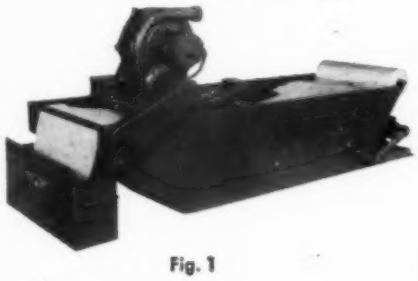

Fig. 1

such as the Vacu-Matic Filter developed by the U. S. Hoffman Machinery Corp. (Fig. 1.)

New Vacu-Matic Filters Increase Production and Cut Costs

Employing a new vacuum method, the revolutionary Hoffman Vacu-Matic Filter provides unusually high flow rates in continuous filtration of machine tool water soluble oil coolants. It is compactly designed to be used in place of the machine tool sump tank. Filter medium is a special, easily replenished paper on which solid particles are deposited. Coolant is drawn through the filtering paper by negative pressure with the dry sludge remaining on top of the paper. When sludge reaches a pre-set thickness, the filter paper is automatically indexed by a pressure differential switch and new paper moved over the vacuum area. Water-free sludge and filter paper drop off into the removable tote box for easy disposal.

Vacu-Matic Benefits and Advantages

- Removes all chips, abrasives, dirt and other solid contaminants with an overall efficiency of 98%
- Greatly reduces down time
- Protects against loading of grinding wheels
- Makes possible higher speeds, faster feeds, improved finishes, a better part at less cost
- Produces a four times greater cake than obtainable by conventional gravity flow through the paper
- Provides a 75% savings in filter paper costs
- Delivers dry sludge without coolant carry-over
- Minimizes coolant loss
- Maintains coolant at room temperature
- Effectively curtails bacteria growth
- Automatic and self-cleaning

The Hoffman Vacu-Matic is available in two models, Vac 40A and Vac 80. Vac 40A has a maximum flow rate of 40 g. p. m. for water-soluble oil coolants with a unit capacity of 50 gallons. The Vac 80 handles a maximum flow rate of 80 g. p. m. and has a unit capacity of 130 gallons.

Summing Up

With proper filtration equipment for delivering clean coolant to the work, it is possible to obtain as much as a 25% to 30% savings in cutting tools, grinding wheels, honing stones, broaches and other individual machine tools. Reduced down time and maintenance, extended useful life of coolants and lubricants, better finishes with fewer rejects, longer runs, sustained tolerances and other benefits, help amortize the costs of filtration equipment in a short time.

If you have a special filtering problem, Hoffman Filtration engineers are at your service to provide a free survey. Without cost or obligation, they'll give you objective recommendations on equipment specifically suited to your needs based on long experience in the improvement of manufacturing technology. To check on the unlimited industrial applications of the Hoffman Vacu-Matic and how it will pay for itself in your plant, send for free Bulletin FB 103, U. S. Hoffman Machinery Corp., Industrial Filtration Division, Thompson Road Plant #1, Syracuse, New York.

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How Cortland Solved a Problem with W OXALUMA VITRIFIED WHEELS

Grinding hardened high-carbon, high chrome tool steel rotary shear blades posed a problem for a western manufacturer. The blades were ground in a special machine using a 12″ diameter x 2″ thick cup type wheel with a 1″ thick rim which had to be dressed down to ¼″ at the grinding face. Trouble was encountered — with wheels of another make — in penetrating the tough, black scale resulting from heat treating, since the wheel quickly loaded. While this was the chief difficulty, other circumstances also had to be overcome.

We proposed a solution in the form of a WA46-H-12V2PW Oxaluma Vitrified plate-mounted wheel. This not only met the dimensional requirements — without dressing the grinding face — but also provided the precise abrasive structure to take this difficult job in stride.

In fact, the user reports: "We are happy to say that these wheels have exceeded all our expectations. They do a very good job on our tool steel parts and we have been getting up to 25 times the life we previously got from other wheels."

This is a random example of how Cortland's engineering know-how has solved grinding problems for large and small concerns the nation over. When you are next faced with a difficult grinding situation, write us. We'll be glad to help.

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Chester, Massachusetts

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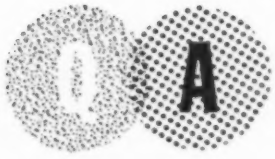

You Asked . . .

CUTTING BAR STOCK TO LENGTH

● **What would be some factors to be considered in determining whether to use a metal saw or an abrasive cut-off wheel for cutting bar stock to length? —P. G. Pittsburgh**

In answering this question, it would be interesting to know whether or not both types of cutting-off machines are available in the plant, or whether purchase of a machine is contemplated, depending on the comparative evaluation of the two proposed methods.

The size of the bar stock would be very important, as it would determine the capacity of the two different contemplated machines.

Another important consideration would be the number of cuts required. If this is to be a production operation and a sizeable number of cuts are to be made, necessitating an operator on full time, we feel quite sure that the abrasive cut-off machine would be found most economical. Metal saws, either straight blade or circular, become dulled and lose their efficiency. The rate of cut of an abrasive cut-off wheel remains the same throughout its productive life.

Loss of stock in the cut might be slightly greater with the cut-off wheel than with the saw. However, the comparatively rapid rate of cut of the wheel as compared with the saw would reduce labor and overhead cost per cut and result in a substantial overall saving.

It would be our suggestion that you contact several manufacturers of both types of machines and obtain actual production figures on bar stock sizes that you will be handling. It might even be possible that they will arrange for your personal inspection of their machines in operation in your locality. •

GRINDING D-2 TOOL STEELS

● **What recommendations would you make for grinding D-2 tool steels such as Allegheny Ludlum's "Ontario" and Vulcan's "Alidie" on a reciprocating table surface grinder, using a 12" diameter straight wheel?—D. G. Youngstown, Ohio**

The tool steels referred to above fall into the category of steels most difficult to grind.

One of the large grinding wheel manufacturers conducted a very intensive research on the grinding of all types of tool steels. As a result of the project, they learned that tool steels could be classified on the basis of grindability, and established an index which indicated somewhat the comparative ease of grinding.

The two steels are classified under No. 3 in the grindability chart.

May we also suggest that your difficulty may have resulted from attempting to surface grind this material with slow table traverse speeds. Comparatively rapid traverse speeds (in the neighborhood of 400" per minute) have been found necessary. These rapid traverse speeds insure that the heat of grinding will be distributed uniformly over a larger surface and will eliminate the possibility of checks. Also, the rapid traverse will eliminate the possibility of the wheel face becoming glazed, with resulting loss of cut. •

WAVY TRAVERSE LINES

● **What might cause wavy traverse lines on ground work pieces?—J. K. Philadelphia.**

Because of the many and varied applications of grinding, it would be difficult to state specifically the cause of waviness. Such a condition usually suggests vibration, either in the rotating parts of the grinder or in the workpiece, the latter being caused by insecure work mounting devices. Many times vibrations of adjacent machines are transmitted through the floor to the grinder in question. We have known instances where high pressure, high velocity coolant streams have caused grinding wheels to vibrate and produce waviness. We would suggest the elimination of machine vibration as a possible cure.

It is also possible that the wheel edges have become slightly ragged. If so, rounding them off slightly with an abrasive stick will usually remove the cause of the trouble. •

The operator on a cylindrical grinder must dog the work piece, move the tailstock to correct position, adjust the table for taper elimination and complete a num-

You Asked . . .

ber of other intricate maneuvers before starting the grinding operation.

However, if there is any difference in actual grinding, it no doubt results from the wide difference in the arc of wheel contact to the work. In cylindrical grinding, the arc is comparatively small—a contact of two cylinders. In surface grinding the arc of contact is much greater—a cylindrical surface in contact with a flat plane.

In general, surface grinding operations require wheels of different grinding characteristics than those used on cylindrical operations, due largely to these differences in the arc of contact. •

GRINDING CYLINDERS VS. FLAT SURFACES

● **The other day I heard a remark to the effect that it is easier to grind a cylinder than a flat surface. Is this true, and if so, why is it?—J. B. Detroit**

Such a statement might be highly debatable among grinding operators. As a result of having associated with many grinding operators, over a large sector of our country, using both cylindrical and surface grinders, we would be forced to conclude that it is simply a matter of preference. Many operators prefer surface grinding for the reason that very little preparation is necessary in machine adjustment before starting to grind. •

CENTERLESS WORK SUPPORT BLADES

● **What are the basic considerations on which the material for work support blades on centerless grinders are selected?—T. T. Dayton**

The basic considerations, in the selection of centerless grinding machine work support blades are blade wear and required finish. In the case of some special very thin blades, strength might have a considerable bearing. Ease of maintenance might also enter into the selection, where the individual shop reground the worn top blade surfaces.

There is considerable pressure of the work on the tip angular blade surface. Natural contact wear, plus particles of abrasive carried in the coolant stream, have a tendency to wear a depression in the top surface. Worn blades must be reground to restore this flat surface and angle.

Blade materials that have a tendency to cut or pick up surface material from the ground part, naturally cannot be succesfully used. Grey iron, meehanite, high speed steel and inserted cemented carbide blades, all seem to be in popular use. In the production of some of the fine rms finishes, fiber and hard rubber capped work blades are very satisfactory. •

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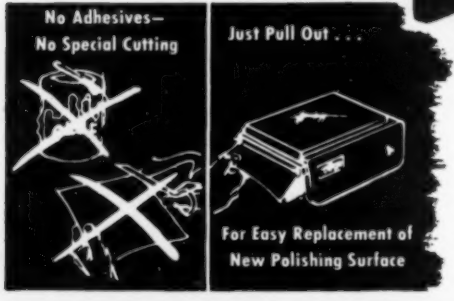

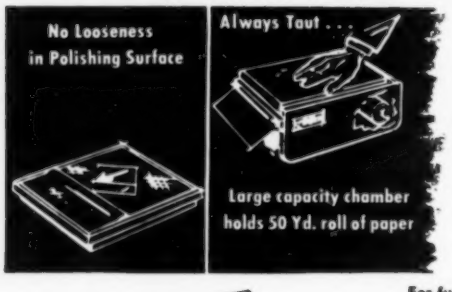

Yes! Here's an effective method for handling polishing paper that has a definite place in many inspection departments and mechanical laboratories. The JOHN CRANE Portable Polishing Stand provides in a matter of seconds a wrinkle free 12" x 12" section of paper held absolutely taut over a metal stage that has been lapped to provide a perfect polishing surface. It also permits the instant replacement of this section of paper once it becomes worn.

For further details and other facts on this very practical tool, write for Bulletin L-410.

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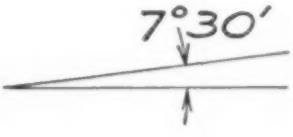
"Notice the action of that vitrified wheel? Free and exceptionally cool cutting!"

This is a knock-out cavity bushing.

It is used in plastic injection molding.

It is manufactured by *FASTEX*,

Division of Illinois Tool Works, Des Plaines, Illinois.

It has a 

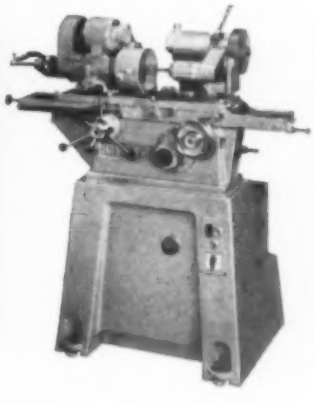
internal taper.

It is ground from hardened tool steel, 58-60 Rockwell C

The tolerances must be held to 0.0002"

The grinder on which this bushing and all its cousins are made is a

RIVETT
MODEL 84



Model 84
An internal specialist with external ability. Mounts interchangeable wheelheads for internal and external spindles. Capacities are 3" diameters, depth 4". Collets and step chucks mount directly in lathe-type spindle.

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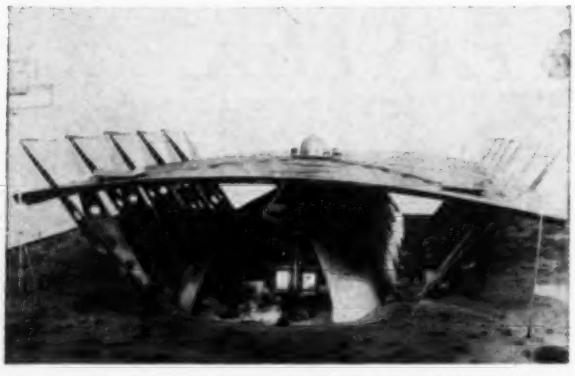
Metalworking in General

Moon Building for Moon Explorers

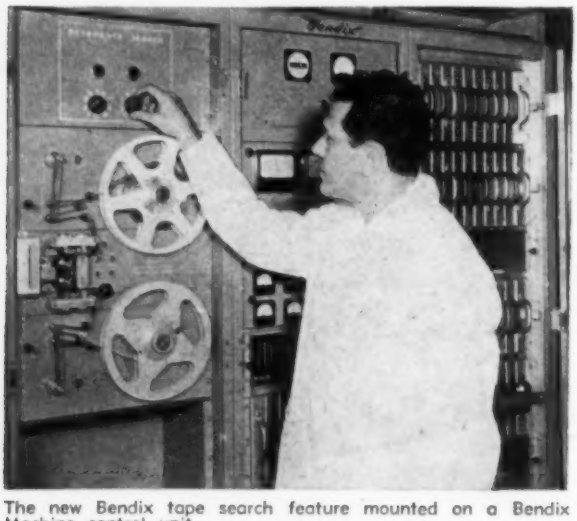


Scale model of moon building, which would be 340' long, 160' wide, 65' high, is designed by the Wonder Building Corp. of America, Chicago, to house living quarters for moon, explorers, laboratories for scientific research, maintenance shops for space vehicles and stations for earth-moon communications. Plastic bubble observatory in foreground is protected by sliding metal doors from intense ultra-violet radiation. Upper section over structure is a protective meteoric shield. Dome in center of barrier is traffic control tower. Special refrigerating and heating plants cope with the extreme temperatures and tremendous temperature gradients which abound on the moon. It was estimated that man could establish a building on the moon in ten years. •

Tape Search Feature Automatically Selects Parts

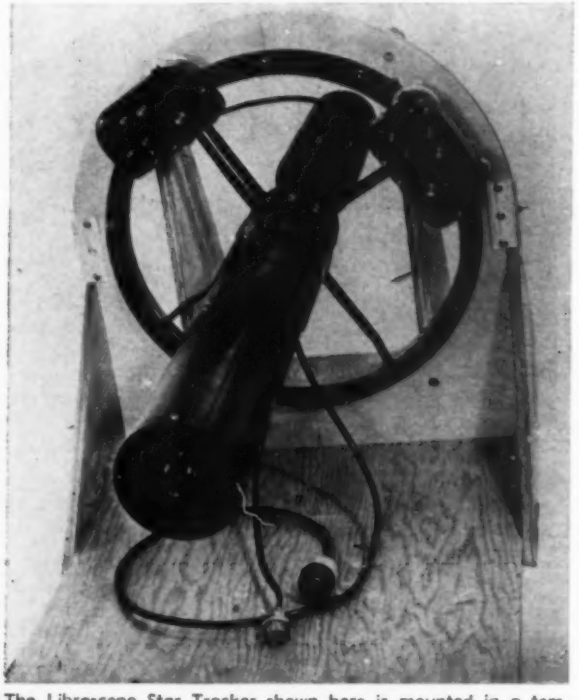
A new tape search feature provides automatic selection of any part program from a library of up to 100 parts stored on the reel of tape, permitting the inclusion of many parts on one reel of tape and eliminating the necessity of changing tapes for each different part to be machined. This reduces tape storage space requirements and increases production operations. The feature is now available on an improved machine tool numerical control system built by the Industrial Controls Section, Bendix Aviation Corp., Detroit, Mich.

In the event of an emergency stop, such as power failure or tool breakage, during machining of a specific part, the reference search feature assists the operator to regain synchronization between the machine tool and the machine control tape. Up to 100 reference codes can be punched on the machine control tape at points corresponding to various key part positions in a long machining operation. The tape reader of the machine control unit reads and controls up to 80 on-off auxiliary control functions which are punched in a special code on the machine control tape. •



The new Bendix tape search feature mounted on a Bendix Machine control unit.

Scientists "Fly High" to Study Mars



The Librascope Star Tracker shown here is mounted in a temporary frame prior to installation in the Schmidt telescope barrel. In the foreground is the opening through which the light from Mars enters. Motions in azimuth and elevation are controlled by actuators mounted on the frame. The Star Tracker locks on Mars and maintains position within one second of arc.

A giant balloon carrying a telescope and two scientists will ascend more than fifteen miles above the earth from a Rapid City, S. Dak. base to study Mars. Dr.

John Strong, Director of the Laboratory of Astrophysics and Physical Meteorology of Johns Hopkins University, and Commander Malcolm D. Ross, the pilot, will look for the answer to the question: Does or does not Mars have an atmosphere that will completely or partially support life? If so, it will prove a resting place for blasting off into deeper space.

The viewing system consists of two telescopes—the large 16" reflecting telescope, and a small 3" dia. Cassegrain telescope centered in the forward end of the large telescope's barrel. A device called the Star Tracker, built by the Librascope, Inc., of Glendale Calif., will lock on Mars and hold the image generated by the main telescope. •

Gage Measures Variation in Wall Thickness

WARREN, MICH: For improving quality control of automotive engine castings, General Motors Process Development Staff has designed an ultrasonic gage that simplifies measuring thousandths of an inch variations in cylinder wall thickness.

This non-destructive tester also can be adapted to measure thickness of straight or curved surfaces of cast iron, aluminum, magnesium, brass, lead, glass and most solid plastics, with only one side of the material accessible.

According to Robert B. Colten, head of Process Development Staff's Electronics Department, the device utilizes the principle of ultrasonic resonance. In effect this means a probing crystal is vibrated against the inside cylinder wall surface, sweeping as high as 4,000,000 cycles per second, until at some frequency point the surface is vibrating in harmony with the crystal.

At this point the wall thickness and the crystal are in resonance. This resonance will vary with the wall's thickness. Thus, it can be used to give an indication of the thickness.

This new tester differs from other resonance frequency devices with its easy-to-read 14-inch oscilloscope tube on which an 11-inch scale is calibrated for thickness variations as low as one-thousandth of an inch. Cylinder wall thickness is indicated by a single, vertical step in a bright horizontal line rather than by two or more vertical "pips" which occasionally need expert interpretation.

Thus, the PDS tester requires no specially trained operator. When it "decides" cylinder wall thickness is substandard or too thin, a red low-limit light flashes on. Mr. Colten said it also is possible to replace the warning light with other devices for automatically marking or segregating substandard parts under test.

The gage was developed at the request of GM's automotive divisions for improved quality control of engine castings. Sometimes in the casting process a core shift will occur. This affects the critical thickness of cylinder walls.

Wall thickness gaging can also be done by magnetic methods, but their accuracy may be influenced by varying magnetic properties of metals under test. Thus, the ultrasonic resonance technique was suggested and augmented by circuitry for the easy-to-read TV-like viewing screen.

The gaging unit is housed in a portable cabinet (27x14½x17 inches) which can be set up in any shop or assembly plant.

A typical thickness range for cast iron is .075 of an inch to .300 of an inch. Other ranges can be provided to give thickness measurements of materials ranging from .075 to 1.0 inch thick, depending on the kind of material being measured. Overall accuracy is within 2 per cent of full scale reading, but this percentage can be reduced for special applications. •

Ford Motor Co. Uses High Strength Steels

DEARBORN, MICH.: Ford Motor Co.'s new ultra-high strength steels compare favorably with best light metal aircraft alloys currently under development, said E. D. Marande, Manager of the Metallurgy Dept. in the Ford Scientific Laboratory. High tensile strengths of 340,000/430,000 lbs. per sq. in. needed to equal the titanium alloys are matched by their new steels, he reported. The process consists of plastically deforming metastable austenitic steels above the martensite temperature, and then transforming them to martensite. High ductility is claimed for these new tough steels." •

The option of selection is particularly important when it comes to precision lapping machines. Apply your own standards of economy, machine size, production line output, piece part size and shape . . . and select a Spitfire flat or cylindrical lapping machine for your own specifications! Spitfire engineers and manufactures the most complete line of lapping machines in the industry to produce flatness to 1 light band, micro-inch finishes to 2 RMS or less. Result: your selection means maximum efficiency and economy—whatever the lapping and/or finishing job!

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Spitfire 24" Precision Flat Lapping machine with pneumatic lifting and pressure arms. Nth degree flat lapping operation coupled with unparalleled unloading and loading facilities. Newest addition to the complete Spitfire line.

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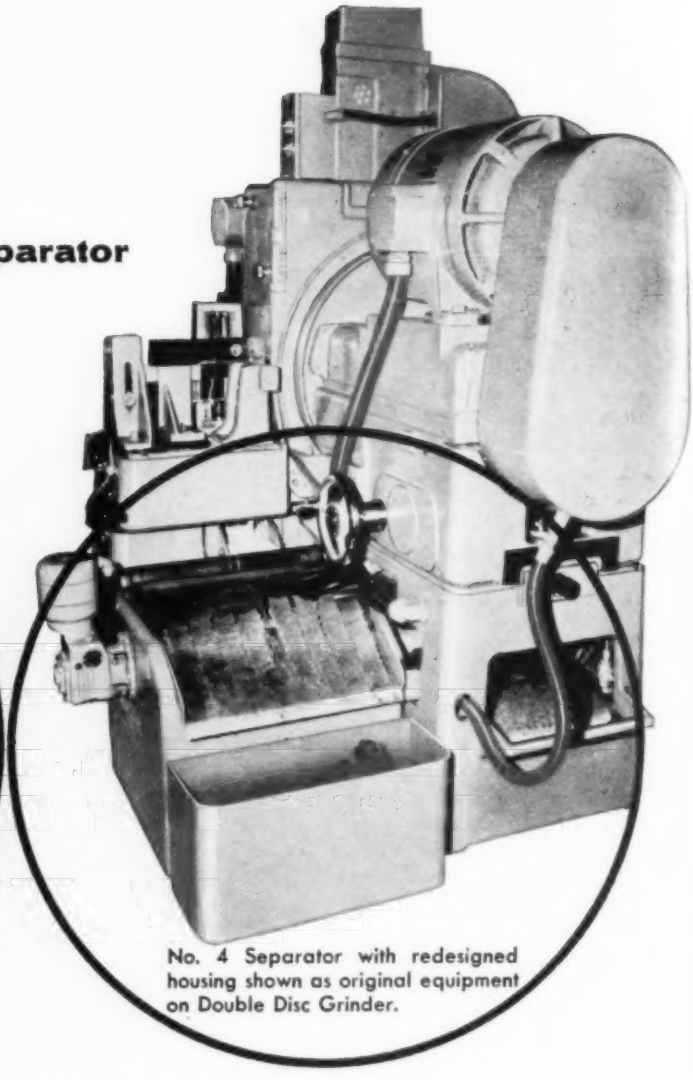
BARNESDRIL Magnetic Separator

easily adapts to machine design, saves cost of piping, troughs and tanks



No. 4 Separator with redesigned housing shown as original equipment on Double Disc Grinder.

This installation shows the flexibility of BarnesdriL Magnetic Coolant Separators as applied to different types of machine design. A standard No. 4 BarnesdriL Separator is used, and the housing extended to the floor. The Separator is hooked directly to the machine discharge and intake, and coolant flows through the separator into the reservoir in the base of the machine.

As a result piping, troughs and outside tanks are eliminated and the separator appears as an integral unit of the machine.

Inherent design of BarnesdriL Separators and Filters lends itself readily to integrating with general machine contours, yet permits easy access and maintenance. Cost savings are realized in the elimination of piping, troughs and outside tanks.

New design data

BarnesdriL engineers have compiled design data and specifications for adapting separators and filters to various types of metal cutting machine tools, and will be glad to supply information on any particular installation. This bulletin will also show you types of systems and installation. Write for a copy!

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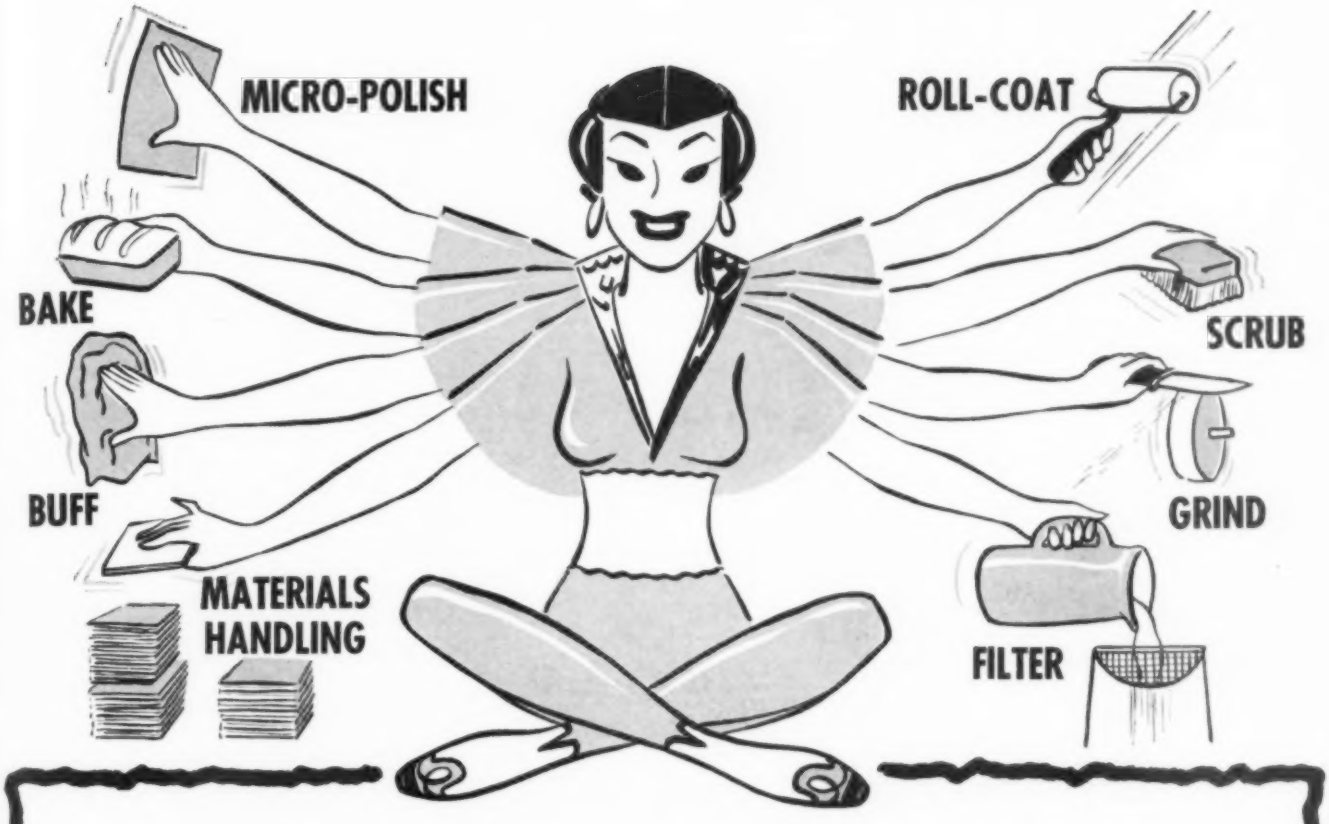

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Figure 1. General view of the surface grinder, workpiece and accessory equipment set up for the grinding of a solid piece of carbide under completely automatic controls.

HOW GOOD ARE

Man-Made Diamonds?

● The availability of man-made diamonds from General Electric Company in production quantities has set off a rash of tests to determine their comparative value in relation to natural diamonds. Yet at the same time there has been very little published information concerning test results. The indications have been that the man-made product was better, but with little tangible and independent printed evidence as to the extent of the superiority.

This article is a report on both laboratory and field tests which have been conducted during the past year by Simonds Abrasive Company. Following the usual practice, the laboratory tests, under rigidly controlled conditions, came first, to give an indication as to what might be expected under production conditions in the field.

In our laboratory, surface grinding tests were conducted under completely automatic controls. Figure 1 illustrates the grinding machine, work piece and accessory equipment. On the surface grinder was placed a Type D1A1, 6 x $\frac{3}{8}$ x $1\frac{1}{4}$ diamond wheel of the general specification D (or MD) 100-N100-B $\frac{1}{8}$. With flood coolant (120 to 1 soluble oil), this wheel ground a solid piece of carbide—surface to be ground measuring approximately 1-63/64" x 4-11/16". Traverse was on the shorter dimension and cross feed on the longer. In the comparison made between wheels, identical conditions of grinding (e.g., traverse, down feed, total down feed, cross feed, spindle speed and traverse speed) were used. Power consumption was recorded at all times. Wheel wear and material removed were determined. Thus, the variables were limited but easily measured. Data obtained was then converted or utilized in terms which are common to industry.

At this point it would be well to stress a most important fact. Since this test was under ideal conditions (no operator error, etc.), the actual values are not important, but the relative values obtained

By CHESTER A. NISULA
Product Manager
Simonds Abrasive Company

Laboratory and field tests confirm the superiority of MD (man-made) diamonds in resinoid, vitrified bonds for carbide grinding. MD diamonds are wasted by heavy down feeds. MD diamonds in 75 concentration top 100 concentration D diamonds in selected applications.

from MD (man-made) and D (natural) diamonds are. For example—if even under controlled conditions table speed were changed, a completely different set of data would have been obtained, but the relative values of MD and D diamonds would be similar to those reported. Therefore, it was deemed best to show trends rather than actual data.

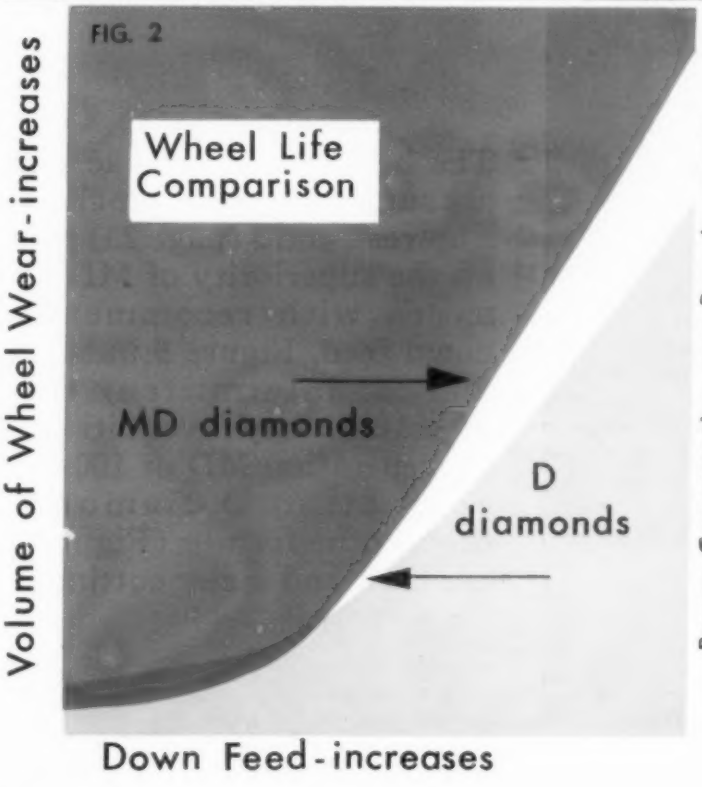
Figure 2 shows the comparison made concerning wheel life. These curves are plotted volumetric wheel wear versus down feed as the measure of wheel life. Since at each and at all levels of down feed total down feed was the same, volumetric wheel wear can be considered a measure of wheel life. The higher the wheel wear, the less the wheel life. Here it was noted that under conditions of the test, MD diamonds were superior to D diamonds when down feed was equal to or near the recommended level. General practice has dictated that down feed for 100 grit should be near 0.001" per pass. Under machine (positive) feeds as in these automatic grinding tests, this superiority continued up to 0.002" down feed. This observation indicated that under hand feeding conditions or when small pieces being ground, etc., the cross-over point of the two curves could move to the right 0.0003" or 0.004" or more.

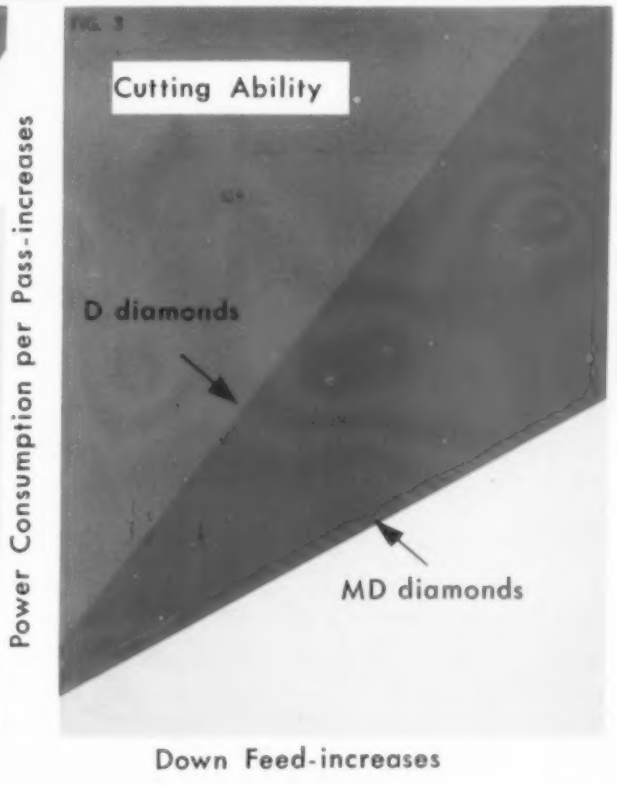
Similarly, if table speed were increased, the cross-over point could be moved to the left. Changes in other factors could also have similar effects. However, as down feed increases, grinding pressure on each individual diamond particle increases. Considering this fact, when observing Figure 2, leads to the conclusion that any condition leading to excessive pressure is detrimental to gaining maximum useful work out of a wheel containing MD diamonds. Of course, this is also true of D diamonds, but it is not as pronounced.

In any completely automatic grinding such as this, cutting ability (or rate of cutting) is reflected in power consumption. Since total power was measured and the power required for the machine was known, it was a simple matter to calculate the power consumed in actually removing carbide on each grinding pass. Reduced power consumption means that the wheel is cutting freer and faster. Higher power consumption means that cutting action is more harsh.

Figure 3 illustrates the comparative cutting ability of the two types of diamonds. Regardless of the level of down feed, MD diamonds consumed less power than did D diamonds. This indicates that in each case MD diamonds cut faster and cooler. Faster cutting and longer life may mean a more friable type of abrasive than D diamonds. (Such a comparison may be analogous to the difference between SA Borolon—a special refined, single crystal, white aluminum oxide, and WA Borolon—white aluminum oxide.)

The lower power consumption, however, does not mean reduced carbide removal. Actually, MD dia-





monds removed more carbide on each grinding pass. This was illustrated when power consumption for clean-up passes was compared. A definite and marked reduction in power was required for the clean-up passes with MD diamonds. This means less carbide remained to be removed after actual grinding passes with MD diamonds.

The reduced power consumption produces another very important result for any carbide consumer. The power used is consumed more in grinding than in developing heat. The less heat formed, the less the chances for cracking (or heat checking) of carbides. The combination of MD diamonds and the more recently developed aluminum powder-filled plastic core (for rapid transfer of heat) safeguards the carbide being ground.

The series of controlled grinding tests showed other characteristics which are of interest to diamond wheel consumers:

1. MD diamonds were easier to dress and to restore the wheel to true rotational form.
2. Though not as important, MD diamonds consumed 1/5 to 1/7 as many dresser wheels as did D diamonds.
3. The finish obtained on carbide at or near recommended feed with MD diamonds was equal to or better than D diamonds.
4. As down feed increased, surface finish with MD diamonds became rougher than with D diamonds.
5. Noise level of MD diamonds was lower than D diamonds. Many consumers use such a property as a measure of cutting action.
6. Because more power was converted to useful work with MD diamonds, the resin bond did not char as readily as with D diamonds.
7. This test included down feeds far beyond the recommended in order to simulate the extreme of completely off-hand grinding. Based on this test, it appears that MD diamonds have the least chance of success on off-hand operations.

With the laboratory tests out of the way, it was desirable to check these findings under production conditions. Fortunately, it was possible to conduct the field tests in a number of plants and tool shops where conditions were varied. Some of these production grinding tests were very detailed but in order to protect these consumers' production data, the reports are in terms of number of pieces or percentage figures. Once again the important thing is the comparison, not the actual data. It should be mentioned, however, that the wheels containing D diamonds were from several vendors including ourselves. Those containing MD diamonds were of Simonds Abrasive manufacture.

One of the earliest tests conducted utilized a tool and cutter grinder. The general wet grinding specification of D180-N100-B ⅛ was used. For this grit size we normally recommend that down feed be 0.0005" per pass. This consumer normally used more down feed than was recommended. In fact, various feeds on the numerous shapes being ground were used in the following production evaluation. Table 1 illustrates the result. In each case, D diamond wheel life is recorded as 100 and is the basis for comparison.

Table 1
Effect of Down Feed on Wheel Life

Down Feed	Life	
	D Diamonds	MD Diamonds
0.0010	100	207
0.0025	100*	153
0.0025	100*	107
0.0030	100	138
0.0035	100	127
0.0045	100	80
0.008	100	54

*Note: Not the same wheel.

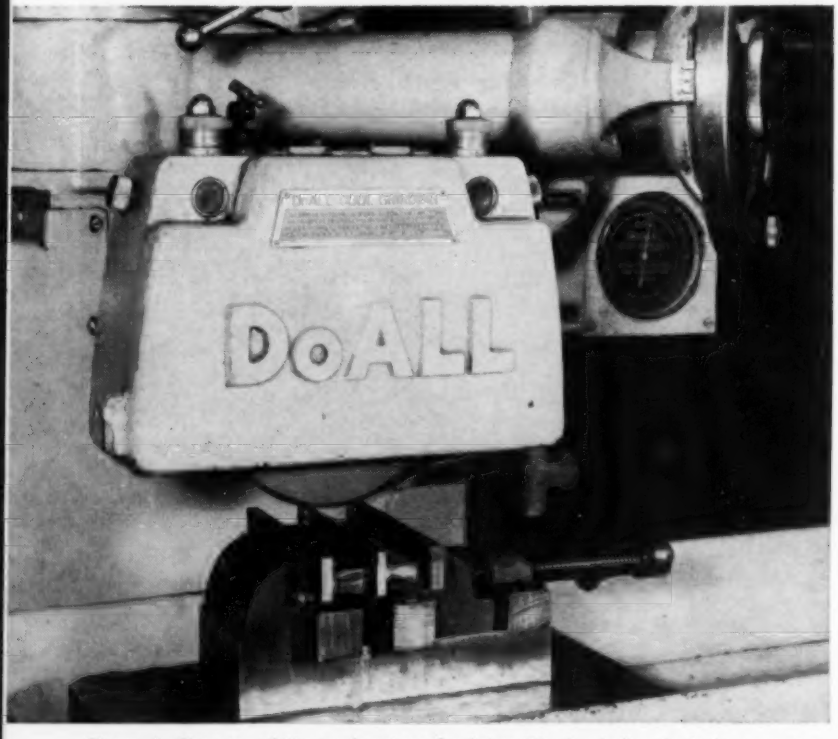


Figure 4. Close-up of the work set-up for intermittent grinding tests to compare 75 concentration MD (man-made) diamonds with 100 concentration D diamonds.

The basic results of the tests are summarized in four charts. Figures 2 and 3 (page 23) point up the superiority of MD diamonds with recommended down feed. Figure 5 indicates that for intermittent cuts, wheel cost may favor either 75 concentration MD or 100 concentration D diamonds, though the former (Figure 6) are freer and faster cutting.

This definitely confirms the laboratory tests that MD diamonds are superior when used at or near the recommended down feed. Yet when down feed increases, the limitations of MD diamonds become apparent.

Some typical performance reports on man-made diamond wheels in resinoid and vitrified bonds are shown in Table 2 below:

Table 2

Source	Operation	Wheel Specifications	Comments
New England textile winding machine manufacturer	Sharpening carbide-tipped large cutters	MD120-M75-B 1/8, Shape D11V9 5" x 1¾" x 1¼"	Equal to natural diamond wheel D120-L100-B 1/8 75 concentration MD equals 100 concentration diamond.
Detroit cutting tool manufacturer	Sharpening carbide-tipped reamers and drills	MD150-R100-B 1/16 Shape D11V9 5" x 1¾" x 1¼"	Longer life than natural diamond wheel D150-R100-B 1/16
Michigan cutting tool manufacturer	Sharpening solid carbide keyway cutters and end mills	MD180-N100-V ¼ Shape D1A1 4" x ¼" x 5/8"	Superior to natural diamond wheels.
Los Angeles saw sharpening shop	Resharpening carbide-tipped circular saws. All-over grind, two sides and top.	MD180-N100-B 1/8 Shape D11V9 5" x 1¾" x 1¼"	Sharpened 45% more tips than natural diamond wheel D180-N100-B 1/8.
New Jersey laminating die manufacturer	Internal grinding carbide dies	MD180-N100-B 1/8 Shape D1A1 1½" x ¼" x ¼"	Longer life and faster cutting than natural diamond wheel of same size.
Midwest farm implement manufacturer	Sharpening carbide-tipped cutters	MD320-N100-B 1/16 Shape D11V9 5" x 1¾" x 1¼"	35% more efficient than natural diamonds.

Another test report was obtained where no vendor or consumer company staff member personally observed the grinding operation of carbide resharpening. The foreman gathered the weekly production reports of wheels containing MD and D diamonds. Wheels containing these two types of diamonds were used alternately, with the operators involved having no idea of the difference. This meant that down feed could vary as could all other variables (however, the operator was not on incentive pay). Here MD diamonds proved to have 70% longer life than did D diamonds.

All of the above results serve to illustrate that, properly used, MD diamonds in resinoid and vitrified bonds are superior to natural diamonds. Wherever this superiority has not shown up, the reason in each case has been the same—excessive pressure on each diamond particle. In one sense, it makes no difference to the manufacturer; he has both available. On the other

FIG. 5

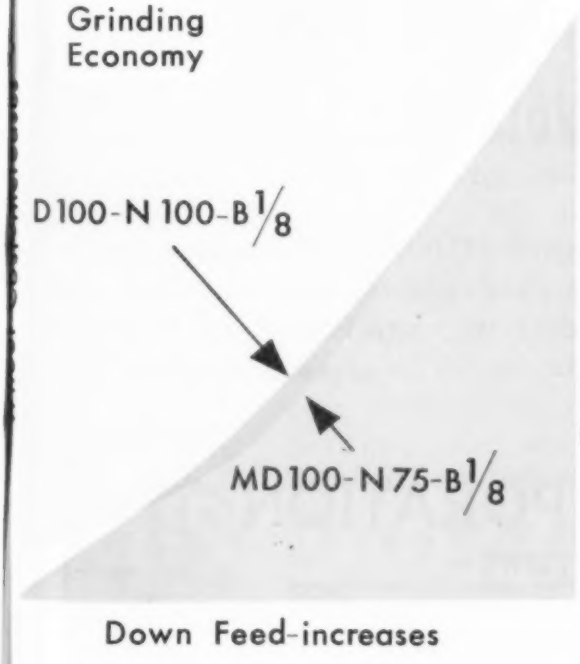
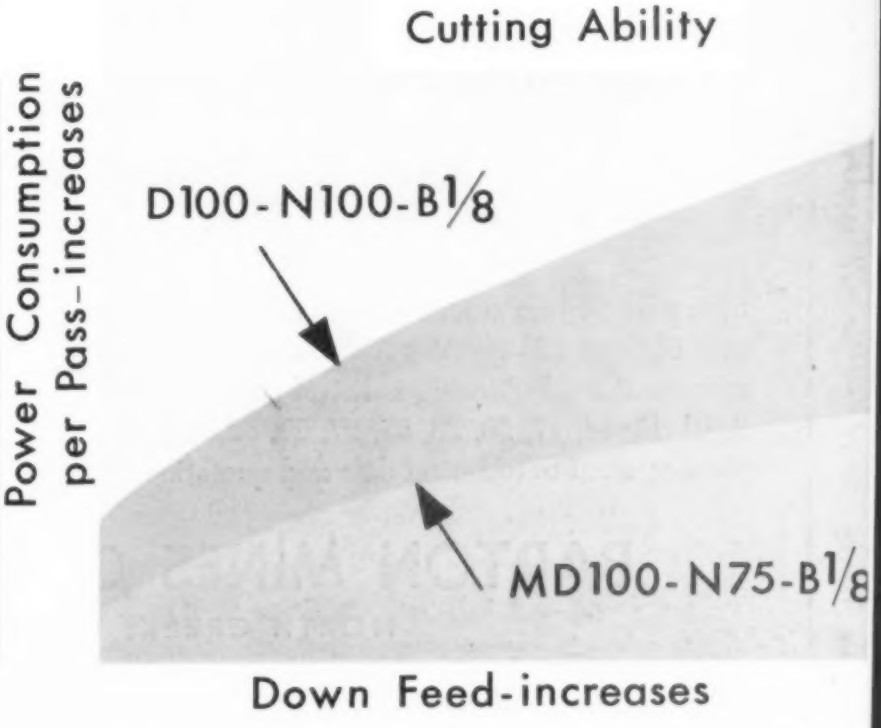


FIG. 6



hand, each manufacturer is interested in giving his customers the product which will produce the best results. Properly applied, MD diamonds will put money into any user's pocket.

Because of the original laboratory tests, the value of 75 concentration MD diamonds also was considered. To satisfy this curiosity, a similar controlled and automatic laboratory grinding test was conducted. This time it was felt that intermittent cut would be more conclusive. Figure 4 shows the "work" set up for this test. It must be mentioned that the traverse across each of the three pieces was such, that the time between the beginning and the end of each traverse before and after each piece was the same as between each piece. Wheel size and other grinding conditions were for all practical purposes the same as the previous tests.

Since the economical factor of wheel cost now comes into the picture, we do not present life in terms of loss of wheel volume loss but wheel cost as determined by dollars per cubic inch of carbide removed. Figure 5 illustrates this. Note that under the conditions of this test, based on wheel cost alone, it may or may not be more economical to use 75 concentration MD diamonds rather than 100 concentration D diamonds. This test, once again, utilized 100 grit diamonds—general wet grinding grade (N). We should note, in all fairness, that at the recommended down feed in this controlled test, 100 concentration D diamonds proved superior. As down feed increased, for an interval, wheel life with MD diamonds definitely increased. Once again we must say that this period of improvement in wheel life can vary from operation to operation. Yet wheel life cannot be the only criterion when cutting ability of the two types of diamonds and the two concentrations are considered.

Figure 6 shows one of the most amazing grinding characteristics our laboratory has ever seen. After reducing diamond concentration to 75 with MD diamonds and comparing with 100 concentration D diamonds, the former proved to be freer and faster cutting. This is illustrated by power consumption (for grinding purposes only) per pass of MD100-N75-B ⅛ and D100-N100-B ⅛. The only explanation that can be given for the freer and faster cutting rate of 75 concentration MD diamonds over 100 concentration D diamonds is that under intermittent cut or down feeds of short duration the more friable characteristic of the former prevails. The wider spacing of MD diamonds seems to give each friable particle more chance to function efficiently. This does not infer that 50 concentration MD diamonds would be even better than 100 concentration D diamonds. As a matter of opinion, this would probably not be true.

To date, field tests of 75 MD diamonds versus 100 concentration D diamonds have not been too conclusive. In cases where pressures have been very excessive—over recommended, 75 concentration MD diamonds have not been superior. Yet, reports have also been received where 75 concentration MD diamonds have proven to equal to or better than life and cutting ability of D diamonds.

The user, of course, is the final judge of the value of any product to him; only he is really in position to judge the weight of the various factors which he uses in selecting diamond wheels. However, the cutting rate of MD diamonds, particularly with light down feed, and the freer, cooler cutting action, are strongly in their favor for many diamond wheel applications. Though natural diamonds will continue to have a place, the long-range outlook appears to be in the direction of greater use of man-made diamonds. • • •

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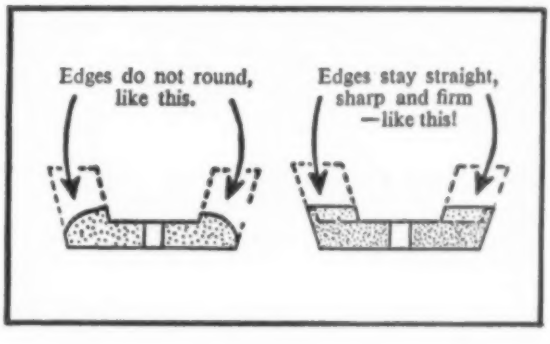

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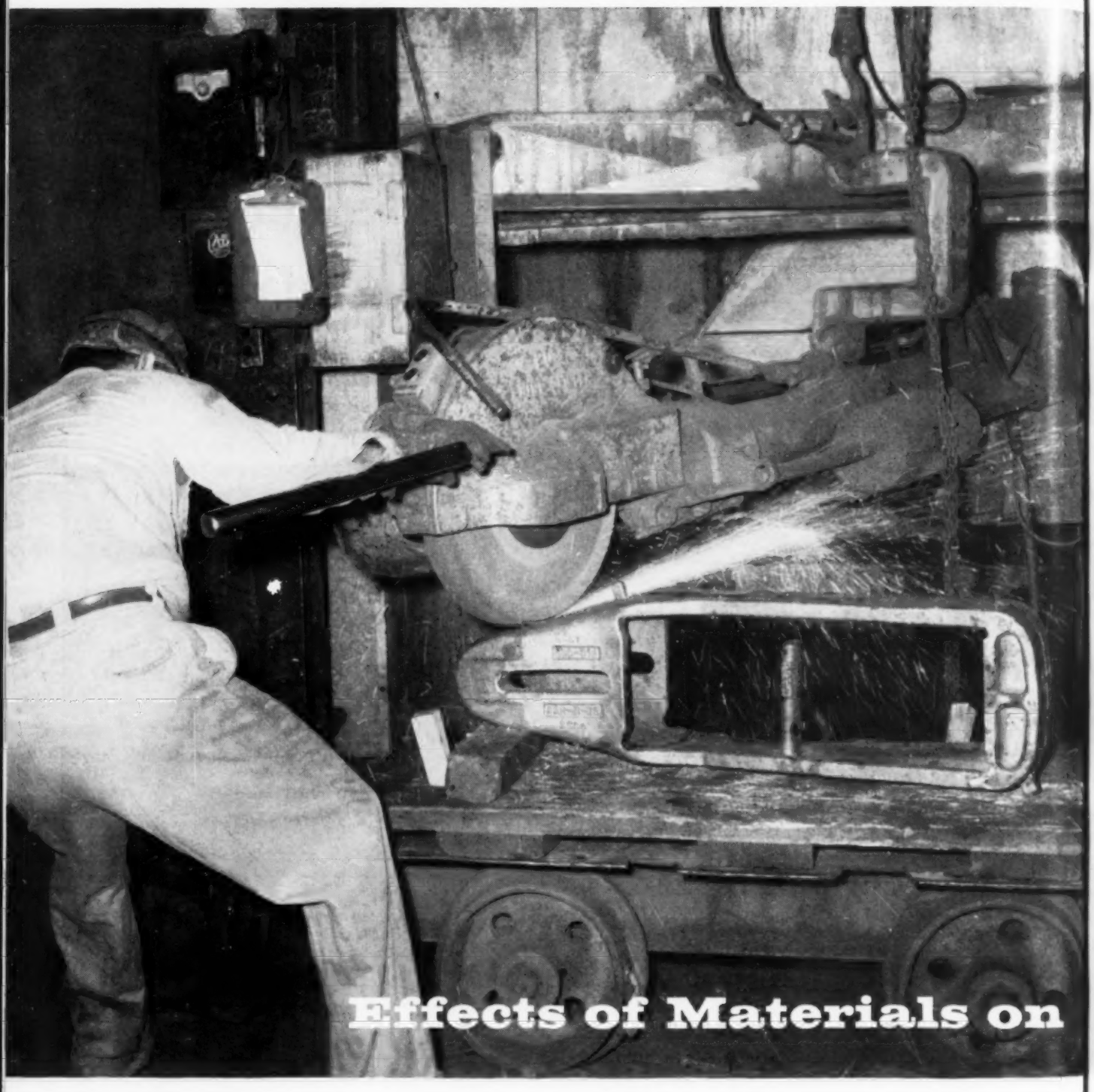

Effects of Materials on Snagging Wheel Performance

Beginning with the startling success of cryolite as an active filler for resinoid wheels, this article traces later developments in snagging wheels, primarily as recorded in patent literature, and concludes that the key to better performance is properly selected combinations of fillers.

by JOHN R. GREGOR, Manager of Sales Engineering
Peninsular Grinding Wheel Sales Corp.

● If one were to ask the owner of an automobile what factors contribute to the efficient operation of his machine, he would probably answer in terms of octane rating, spark plug gap, and timing of the spark, as well as other factors. This is because information concerning automobile engine performance is fairly widespread.

But if you were to ask the same question of a superintendent in charge of many snagging machines, chances are he might be at a loss for an answer. Certainly, the measures of grinding wheel efficiency are well known, and the methods of measuring efficiency have been the subject of several articles.[1] But in recent years, some controversy has grown up among users of dense snagging wheels concerning the factors contributing to snagging wheel efficiency. Some of these ideas, like the folklore of a by-gone day, are at best partly true and at worst completely false.

That snagging wheels can be made by different processes is well known; that different manufacturers put different compounds into their wheels is probably realized, but not necessarily well understood; and the effect of each of the above on the efficiency of a snagging wheel is a source of much confusion. Historically, it appears to have been the materials used, rather than any particular method of manufacture, which have brought about the greatest advances in snagging wheel efficiency.

The evolution of the technology of snagging wheels is well documented in the patent literature and it is from this source that most of the following information has been drawn.

The study begins sometimes in the mid 30's (the exact date is not important), when one of the grinding wheel companies thought to use cryolite in their vitrified wheel bond. As the tale goes, the material did not work too well in the tests, but rather than throw it away, they decided to try it as a filler in resinoid wheels, the choice being just as casually made as it would have been had they been considering iron oxide, flint, Feldspar, or any of the other inexpensive, inert materials in use as fillers at the time.

When these snagging wheels went out into the field, the results were phenomenal. As with many another break-through, the men responsible for the discovery apparently did not at first realize its importance, and by the time they did uncover the "magic ingredient" that had given these wheels the tremendous increase in efficiency, it was too late to apply for a patent, since by then the discovery was available to all manufacturers.

To illustrate just how important this discovery was, Greenland Cryolite is still a major filler material in the snagging wheel industry. It took many years of research to understand the nature of this discovery, but the answer is now embodied in the generally accepted "active filler" theory.

This theory suggests that the role of an active filler is twofold. First, the material melts and lubricates the surface beneath the abrasive grain, and second, it reacts chemically with the chip formed by the grain to prevent this chip from melting back into the main body of the steel.

Grinding experiments performed in a vacuum showed very low efficiencies, and the rate of metal removal was practically nil. The reason was that as each chip or furrow was formed, friction heated the metal to the plastic state and the chips rewelded into the main body of the steel. The same tests when run in air showed somewhat improved efficiency, but when run in an atmosphere of chlorine these tests disclosed a marked increase in efficiency and a high rate of metal removal, because the chlorine gas was reacting with the chip surfaces and preventing them from rewelding, thus making it easier for the abrasive particles to carry the metal away.

The wheels that contained cryolite back in the mid 30's were manufactured in the same manner as wheels had been in years before, by a process called cold-pressing. What made these wheels better snagging wheels than their predecessors was the ingredients in the wheel.

Stainless steel mill conditioning rooms have constantly found the need to increase pressure on grinding wheels to facilitate faster metal removal and greater production. Confronted by this problem, the manufacturers of snagging wheels in the early 1930's soon found that the formulation of liquid resin, powdered resin and abrasive then in use would not stand increased pressures. They also found that they could not make wheels very much harder or denser than they were then manufacturing, because the volatile substance formed by the reaaction of the resin present caused faults and weakening of the wheels.

In July of 1936, however, a patent was issued describing a method of producing wheels using a heated autoclave to prevent gas formed during cure by the resin from causing pockets and disturbing the shape of the wheel.[2] This proved to be a cumbersome method, however, and in November of 1937, there was a patent application concerned with the use of lime in snagging wheels.[3] Where the autoclave had merely counterbalanced the pressure of the volatile materials, the lime combined chemically with these materials and inactivated them. This permitted the production of maximum density snagging wheels, but did not change the relative efficiency of the wheel. Steel mills then found that as wheel specifications became harder, if the pressure on the machine was kept constant, steel removal rate dropped off. If, however, they increased the pressure on the wheels, the life of the wheel was reduced, but at the same time the removal rate was increased. One way or the other, grinding costs were increased.

Because it took some time to find the reasons for the increase in efficiency brought about by cryolite, it was not until late 1940 that a patent dealing with fillers other than cryolite in wheels for snagging stainless steel was issued.[4]

In November of 1940, a patent was applied for by Mr. Birger Egeberg[5], then in the employ of the International Silver Co. Mr. Egeberg was involved with grinding stainless steel cutlery, and he found that by incorporating certain sulphides, such as iron sulphide, molybdenum sulphide or manganese sulphide into the wheel formula he was able to increase the efficiency of his wheels by a substantial margin. While his operation was not in any sense a snagging operation, his findings were to have substantial impact on the manufacture of snagging wheels for grinding stainless steels. In fact, in February of 1942, there was issued another patent effective just before Egeberg's, which also discusses iron sulphide.[6] This latter reference is the beginning of a series of discoveries that led to the first substantial improvement over cryolite-filled snagging wheels.

Up until now, the discussion has been concerned essentially with sale or mineral type fillers, all dry, powdered materials, generally having a melting point below 1200° C, and non-hygroscopic.

However, in June of 1942, a new endeavor into the field of snagging wheel improvement came about.[7] This patent discusses halogenated liquid compounds, and is particularly concerned with certain chlorinated

glycol compounds which are derived from the same substance that is used in permanent anti-freeze in automobiles. Here was another method of increasing the metal removal rate of snagging wheels, while keeping the wheel wear rate relatively constant. These liquid materials served to make the wheels easier to manufacture, and because during decomposition they evolved hydrogen chloride, which is corrosive to stainless steel, they aided by helping the wheel to cut steel with greater efficiency.

1942 must have been the year of culmination of a number of projects in the grinding wheel industry, for in the same year there was also an application dealing with potassium fluoborate.[8] This material was said to be somewhat more available than cryolite, and the main reason for patenting it was that it was about as efficient as cryolite and therefore could be used in case the source of cryolite was lost during the war.

In January of 1946, an interesting patent was issued —recall that in 1940 iron sulphide was discussed as a filler for grinding wheels and in 1942 potassium fluoborate was uncovered. S. S. Kistler[9] observed rather startling results when the above two materials were used together as fillers in grinding wheels, an increase in efficiency greater than when either was used alone. Here was a break-through second only to the discovery of cryolite. Each of these materials was an adequate filler alone, but when used together in a snagging wheel the increase in efficiency over cryolite was of the order of 15%. It was about this time that Dr. Kistler and his staff put all of the advances that they had made to date into one snagging wheel. They decided to use the hot-pressing technique since this was the only method then known to produce an ultimate density wheel. They put the fillers and the liquid ingredients mentioned in the various patents into the wheel to form an efficient as well as a dense, or wear-resistant, grinding wheel. Because this wheel represented a density one grade harder than Z grade which was the maximum hardness shown on their grade chart, they decided to call it ZZ grade. The success of this wheel was such that the term ZZ and hot-pressing soon became synonymous, but it seems likely that the hot-press technique was at most only slightly responsible for the efficiency of the grinding wheel. It was mainly the means of incorporating a series of efficiency-producing materials into the wheel.

Starting about 1949, the subject became a matter of concern to a number of companies in the grinding wheel industry. Many patents were applied for and issued in the years 1949 through 1955. [10, 11, 12, 13] and [14]. They covered a variety of compounds, all of which increased the efficiency of the grinding wheel without adversely affecting the life of the wheel. In the main, these developments were disclosed for use in wheels made by the cold-pressed method, because of the greater ease of manufacture accompanying this system. Among these patents is the discovery of the synergistic effect of filler materials as described in the Gregor patent,[12] which further pushed back the barriers that had first been opened by the revelations in the Kistler patent.[9] Here is disclosed the fact that various combinations of filler materials, particularly a sulphide and a salt from a select group, work best at a particular ratio; and, that that ratio is not necessarily 50-50. Thus, sulphide A and salt B may have their peak efficiency at ratio 80-20, whereas sulphide D and salt C may work best at a ratio of 60-40. Figures 1 and 2 show in graphic and tabular form some typical results of such variations.

The attempts to make cold-pressed wheels as hard or wear-resistant as hot-pressed wheels met with little success until a method of cold-pressing the wheel to

FIG. 1

Filler	Wheel Wear In. 3/hr.	Removal Rate*	S/W	Efficiency Factor
cryolite	54.78	41.58	.759	93.0
Salt A	76.62	47.04	.614	80.9
75% Salt A 25% sulfide B	66.10	54.72	.828	110.3
50% " 50% "	60.48	54.90	.908	118.5
25% " 75% "	52.29	49.74	.951	125.5
100% sulfide B	57.21	44.88	.784	99.3

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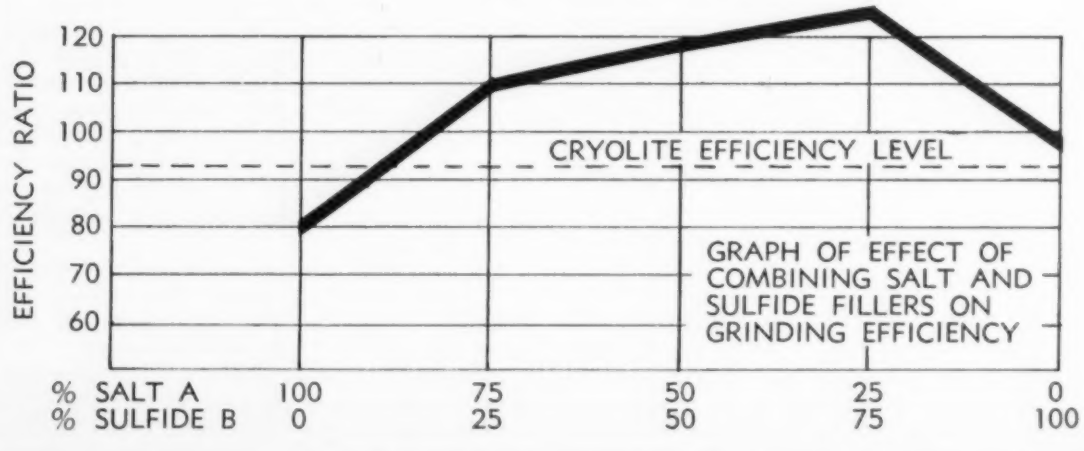

FIG. 2

Filler	Wheel Wear In. 3/hr.	Removal Rate*	S/W	Efficiency Factor
cryolite	52.04	39.96	.768	92.5
Salt C	54.15	46.86	.865	110.5
75% Salt C				
25% sulfide D	49.66	48.30	.973	123.5
50% " 50% "	51.14	49.14	.961	122.4
25% " 75% "	48.04	44.64	.929	117.1
100% sulfide D	49.45	41.52	.840	103.7

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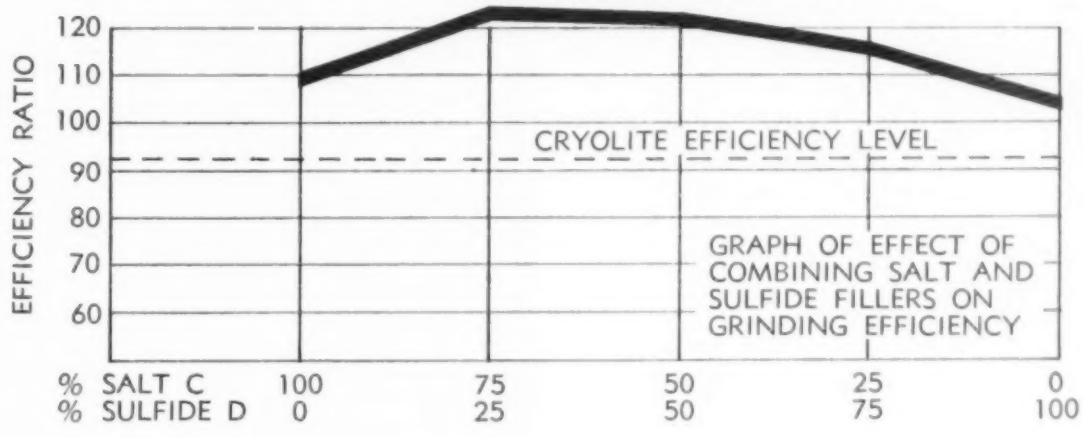

ultimate density was devised. This came about with the discovery of formulations which would allow the incorporation of large amounts of plasticizing agents. With this formulation, the bond, under pressure with no heat, will flow and fill up all of the voids in the mold. This concept, coupled with improved abrasive of the micro-crystalline type; changes in resin which allowed the manufacture of more wear-resistant wheels; and liquid components which were compatible with the bond and yet increased the cutting action of the wheel, brought about the manufacture of cold-pressed wheels which were in every way equal to or better than their hot-pressed counterparts.

Any grinding wheel, regardless of the method by which it is manufactured, has the limitation of being only as efficient as the materials of which it is composed. Neither cold nor hot pressing is in any sense of the word the ultimate in snagging wheel manufacture. Proof of this is seen in a recent patent describing a novel method of producing ultimate density snagging wheels which does not employ pressing at all, but forms the wheels by a vacuum process.[15]

Grinding wheel companies, individually and as a group, are constantly striving to improve methods of metal removal with grinding wheels. Users of snagging wheels or any other kind of grinding wheels should never rest content with the idea that a wheel manufactured by any particular method is the only wheel that will do a specific job for them. Rather, they should judge the wheels on the merit of their operating efficiency and initial cost, and make their decision based upon which wheel costs less in terms of dollars per unit of metal removed.

Resinoid wheels are particularly adaptable to improvement through component variation. The temperatures to which resinoid wheels are subjected are low enough to permit many organic and inorganic materials to retain their identity within the bond. The chemical characteristic of the binder is such as to allow infinite variation in its physical and chemical properties and to make possible its reaction with many modifying materials. The resin industry is constantly developing new materials which are possible binders for abrasive wheels. The reasons for various fillers and liquid components causing changes in grinding efficiency are not yet fully understood.

Many theoretically possible abrasive materials have not been investigated and the theory of grinding has not yet been developed to the point where a valid prediction can be made as to the suitability of a material for use as a grinding wheel abrasive.

For these reasons, it is not out of order to predict that the efficiency of snagging wheels will greatly increase in the next decade. Materials now only being written about in the laboratory books of the grinding wheel companies and manufacturing techniques presently in the dream stage will make this prediction a reality. • • •

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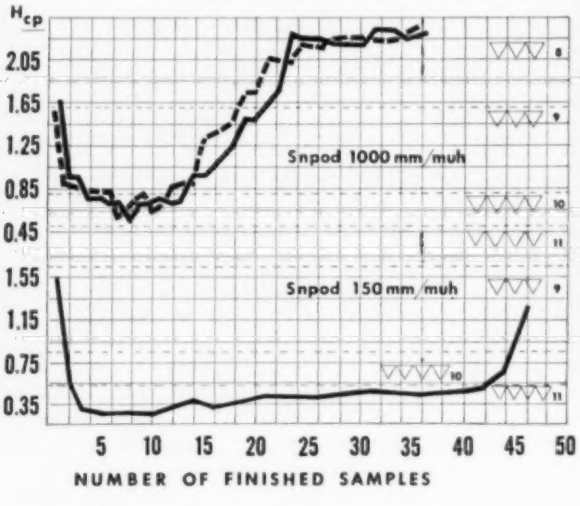
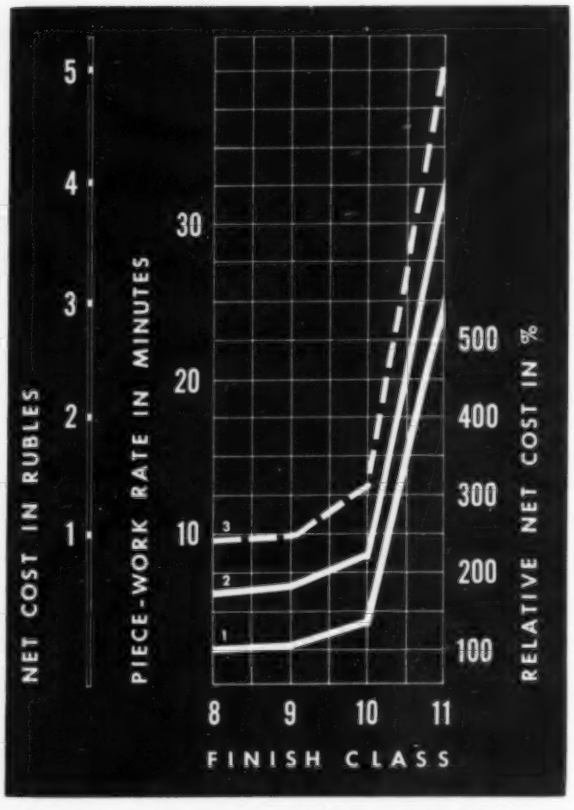
Russian Research in Fine Finish Grinding

This review of a Russian article which appeared in one of their recent trade papers indicates the importance the Russians are placing on their grinding operations. Note also the importance they have placed on the economics of grinding.

by A. J. STEIGER





● Figure 1. Curves of roughness depth variation during fine finish grinding.

● Figure 2. Labor time and net cost curves for fine finish grinding to varied class of surface finish.

● A new Russian method of fine finish grinding without special fixtures, making it possible to get 10 and 11 class finish[1] on standard grinders, has been given a high labor-saving rating and is expected to find wide application in Soviet machine and tool shops, according to a recent report from Moscow.

The net costs of fine grinding for 8 to 10 class finish[1] are reportedly cut, by the new method, to less than half what they were in Russian industry. The Moscow report included the details of the grinding research that went into the development of the new method.

Fine trueing of the abrasive wheels with diamond or diamond-substitute tools, at a very low-speed feed, is a basic feature of the new fine finish method which was developed by the USSR's Experimental Scientific Research Institute of Metal-Cutting Lathes.

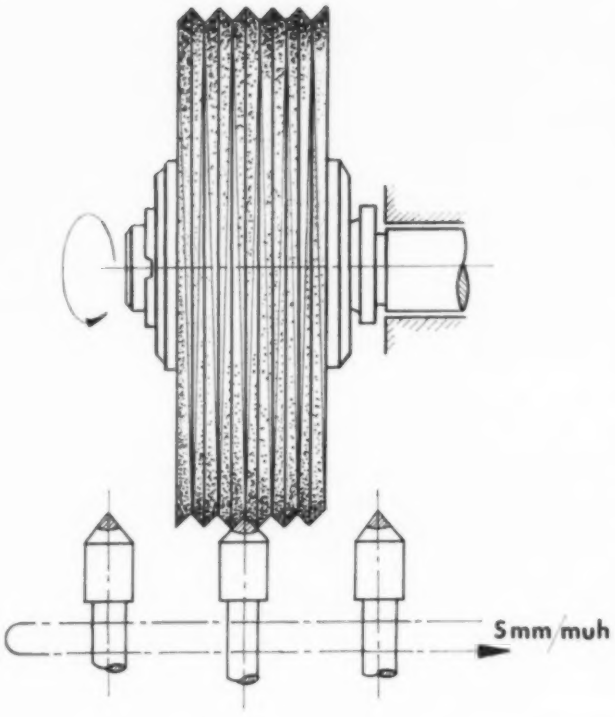
The basic research on which the new development rested was a microscopic study of the effect grinding wheel trueing methods have on the product finish. The report, describes how characteristics of abrasive wheels finish are reproduced in the finish grinding of the work-piece.

A fine trueing process that involved feeding the dressing tool at 0.00039" per wheel rotation instead of the usual 0.0157" to 0.0197" was developed as a result of the grinding wheel dressing research carried out on electrocorundum wheel having ceramic bond and grit sizes of 46 to 60, the report stated.

(1) Russian class 8 to 9 finishes are top for machining such as reaming, broaching, fine trueing and fine milling. Class 14 is top for fine grinding, lapping and honing.

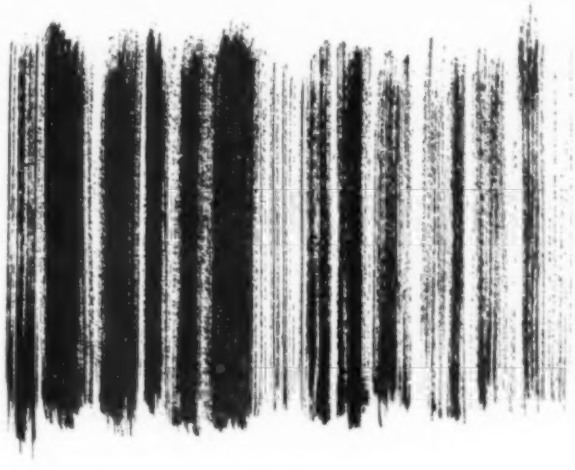
Research in wheel trueing without diamond tool showed that equally fine grinding wheel finish could be obtained with a hard alloy[2] wheel indicating that the possibility of using diamond substitutes to dress wheels for fine finish substantial savings in diamond tools which are expensive and in short supply.

The performance ratings of the new Russian method for fine finish grinding were made on the basis of



• Figure 3. Schematic of cross trueing.

• Figure 4. Disc roughness with cross trueing, in flat reflection.



research tests carried out at the Leningrad Institute of Engineering Efficiency to determine what actual time, labor and cost savings the new method made possible. The Russian engineer in charge of the research, Doctor of Technical Sciences A. A. Matalin, gave this account of the tests and results: :

"The fine finish grinding tests were made on rollers of standard 45 steel[3], 1.97" in diameter and 11.8" long. The blanks were turned in advance to a 5 class finish with 0.0118" allowance for grinding. The grinding was done on a cylindrical grinding machine with ceramic-bond abrasive wheels, two-way in-feed (to grinding depth) equal to 0.00039", without applying attendance; wheel speed was 99 ft./sec, work-piece speed was 133 to 150 ft./min. The longitudinal feed varied in the limits of 2.95 to 39.4 in./min. Running water cooling.

"Grinding wheel trueing was done with a diamond pencil; the diamond made four preliminary passes of 0.00059" depth at longitudinal speed of 0.0157" per wheel rotation, one finish pass of 0.00039" depth at longitudinal speed of 0.00039" per wheel rotation.

(2) Russian hard alloy is cemented carbide.

(3) Average grade carbon steel.

"Under the method described, it took 10 minutes to dress a wheel 23.6" in diameter and 2.64" in thickness. Wheel trueing completed, a batch of turned roller blanks was then ground to a fine finish, after which in a double or interference microscope the depth of finished roller roughness was measured and the precision of their dimensions and geometric form determined. Not less than two batches of roller samples were processed for each given grinding rate tested.

"The curves in Fig. 1 (see attached illustrations) show that the roughness of the ground surface is continuously changing in the process of grinding. In the first moment of grinding after trueing, 'running-in' takes place, during which separate projecting abrasive grains are broken out from the bond and dulled. At the same time the roughness of the finished surface is continuously diminished and after the grinding of 3 to 4 specimens, is stabilized at its minimum value.

"After a definite number of rollers have been finished at a given grinding rate, the effective area of the wheel begins to wear down and becomes glazed, while the depth of the finished surface roughness increases.

"The wheel's durability under given grinding and trueing conditions sets the number of rollers that can be ground within the limits of the finish class tested.

"Shown in Table 1 below are labor and cost figures for fine finishing of the rollers mentioned above with grinding wheel speed of 1.18"/sec and depth of 0.01 mm.

Table 1

Class of finish	Conditions of grinding: work-piece speed in ft/min	work-piece rate in rpm	longitudinal speed in inches/min	Piece-work rate in minutes	Net-cost in rubles	Relative net-cost in %
8	133	300	39.4	6.1	0.98	100
9	133	300	39.4	6.47	1.03	106
10	133	300	39.4	8.64	1.38	142
11	133	300	5.9	32.6	5.22	534
11*	133	...	39.4	9.47	1.52	155
11**	133	...	5.9	9.47	1.52	155

*Preliminary grinding to 7 to 8 class finish leaving .00079"—0.00158" stock.

**Final grinding.

"When estimating the labor and production cost of fine finish grinding, the time spent on wheel trueing is incorporated with the time spent grinding the first parts after trueing.

"The net cost of finishing one standard roller 1.97" in diameter and 11.8" long is estimated by calculating the labor spent in processing the parts according to a given grinding rate, taking into account the portion cost of wheel trueing per part.

"The net cost of fine finish grinding also embraces the wage payments for work performed, taking into account the 300% overhead expenses that are usual for work in grinding shops and sections of machine-building plants and also the cost of fine trueing.

"Net cost estimates do not include the per part expenditure of the grinding wheel and trueing diamond, as these costs are negligible.

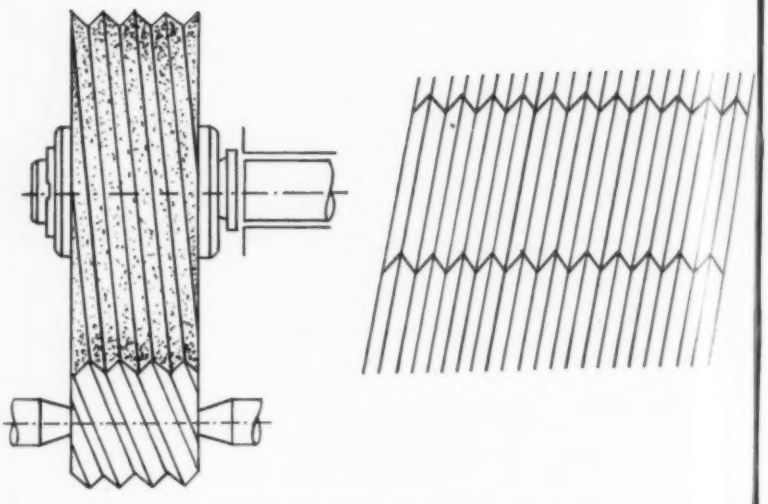
"The tabulated data and curves of Fig. 2 show that in fine finish grinding, raising the class of surface finish from 8 to 9 does not entail difficulty of any kind nor require additonal expenditures. Further rise to class 10 finish entails a 40 to 42% increase in required labor and net cost while for 11 class finish labor and costs are 5.2 times higher than for 8 class grinding.

"The absolute figures tabulated and graphed are based on tests and calculations for the least advantageous case of roller grinding when the roller was turned in advance to class 5 finish leaving a stock removal of .0118". For high finish classes, it is expedient to give the blank a semi-finish machining to class 7 or 8 finish, reducing the stock removal for final grinding to 0.00079"—0.00158".

"Pertinent estimates show that compared to current net cost of conventional grinding, the net cost of fine finish grinding is 2.13 times less for an 8 class finish and 2.38 times less for a 9 class finish, when grinding standard rollers.

"The fine finish method can be applied with success in ordinary working conditions at any machine-building plant that has good grinding machines. To produce precision parts of high finish conventionally, it is necessary to adjust the grinders, eliminate radial and axial play in machine spindles and secure smooth skipless travel of the longitudinal feed mechanism.

"Fine wheel trueing requires that the longitudinal feed mechanism feed the diamond at the rate of 0.00039" per wheel rotation. Some out-moded machines do not have such fine feed. Research has shown that finished surface roughness is perceptibly increased with increase of longitudinal feed in wheel trueing. However, if the diamond's longitudinal feed does not exceed 0.00197" per wheel rotation (the most typical feed for the majority of grinding machines), then



• Figure 5. Schematic of roughness formation in work-piece in case of unilateral trueing and in-feed grinding.

without additional attendance a class 10 finish can be formed with grinding at work-piece speed of 133 ft/min, longitudinal speed of 5.9"/min feed and of 0.00039".

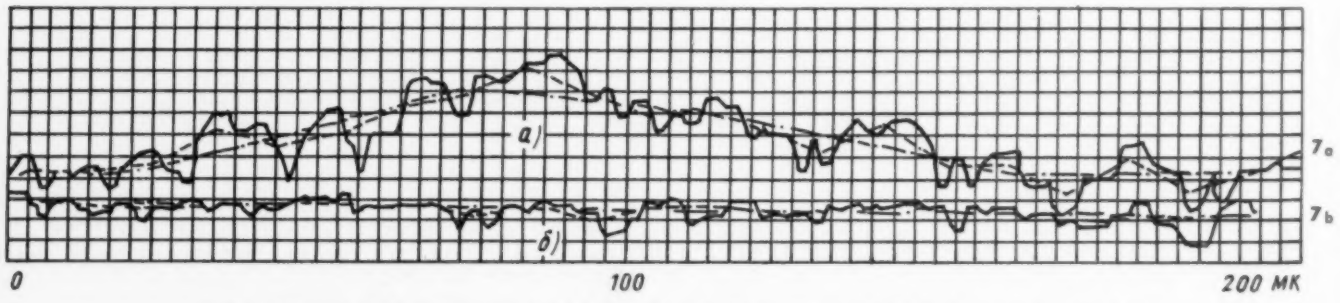
"When the conditions indicated are applied with a stock removal of 0.0118" from a blank turned to class 5 finish, the labor spent on fine grinding of a standard roller to class 10 finish amounts to 32 minutes and the net cost to 4 rubles 90 kopeks. If the variable grinding conditions shown in the bottom lines of the above Table are applied, a class 10 surface finish can be produced in 9.1 to 9.3 minutes at a net cost of 1 r. 46 k. to 1 r. 50 k.

"To get a finish higher than class 10 on obsolete grinders, a special attachment can be used for sliding the diamond during trueing at the required speed for feeding it at 0.00039" to 0.00079" per wheel rotation."

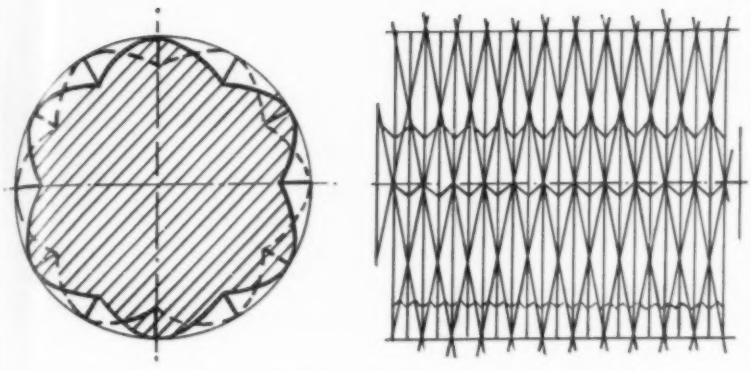
The wheel trueing process which is at the core of the fine finish grinding method was a prior development that stemmed from experimental Russian research carried out to determine what effect the trueing of abrasive discs with diamond tools had on the finish of the ground surface.

The shop and laboratory research established that the wheel trueing method and conditions were of paramount importance among factors affecting the surface finish, since any roughness of the grinding wheel was transferred to the surface of the work piece in the process of finish grinding.

The roughness transfer effect explored in the Russian research is shown in schematic diagrams—Figs. 3, 4, 5 & 7—illustrating how the work piece finish



• Figure 6a and 6b. Profile curves of finished surfaces. Symbols:—curve plotted conforming to all points measured; - - - curve plotted conforming to average for 10 points; -.-.- curve plotted conforming to average for 30 points.



• Figure 7. Schematic of roughness formation in work-piece in case of cross trueing and in-feed grinding.

reproduced the roughness of the wheel dressed by unilateral and bilateral or cross trueing.

"The regularly transferred roughness created in the wheel by trueing is thus the principal factor determining the roughness of the finished surface. In geometric parameters (depth and pitch), the roughness considerably exceed roughness from separate grains. Hence, it follows that the longitudinal feed which directly determines the trueing pitch has to be set not to the minute but in millimeters of the wheel rotation.

"The finish of the polished surface is determined not only by the wheel grit size and grinding conditions, but to a large extent depends on the trueing process. Trueing groups the grains and creates roughness in the wheel, which on transfer to the work piece being finished substantially exceeds that which is formed by separate grains.

"The regular, although not always periodic roughness from trueing, which determine the wheel's microrelief, are termed the waviness.

"If the roughness depth and pitch of waviness in the wheel are so small as to be practically undetectable, then roughness characteristic of the finished work piece is directly determined by the tracks of separate wheel grains. A wheel relief with roughness depths that are small as possible for the given grit size, thus also will secure minimum roughness depth in the finished work piece.

"The possibility of getting a wheel profile without waviness was demonstrated experimentally by testing trueing and grinding conditions in a large number of work pieces. In the range of longitudinal feeds from 0.00197" per one wheel rotation and lower, waviness is practically undetected (see Fig. 7b contrasted to 7a, the waviness curve of conventional trueing). Trueing at the feeds indicated which were never before used, we have termed fine trueing.

"The surface of the finely dressed wheel without waviness is characterized by wheel grains having renovated area, form and cutting edges similar to those formed under usual trueing.

"The optimal conditions of fine trueing and finish grinding have been determined in shop conditions.

"Preliminary grinding is done under conventional conditions for class 7 surface finish. The allowance left for finish grinding is from 0.00039" to 0.00118".

"Fine trueing process:

"(1) Preliminary passes (the number set according to degree of wheel wear and dullness) with longitudinal feed of 0.0118" to 0.0157" wheel rotation and depth of 0.00079".

"(2) Final pass (unilateral trueing) with longitudinal feed of 0.01 to 0.02 mm per disc rotation and depth of 0.00039".

"Finish grinding process:

"Work-piece rotation speed in ft/min.	50 to 100
Longitudinal feed in inches per one work-piece rotation	.039 to .079
Depth of grinding in diameter during one pass inches	0.0002 to 0.00039

"The number of passes is determined by the allowance left for finishing.

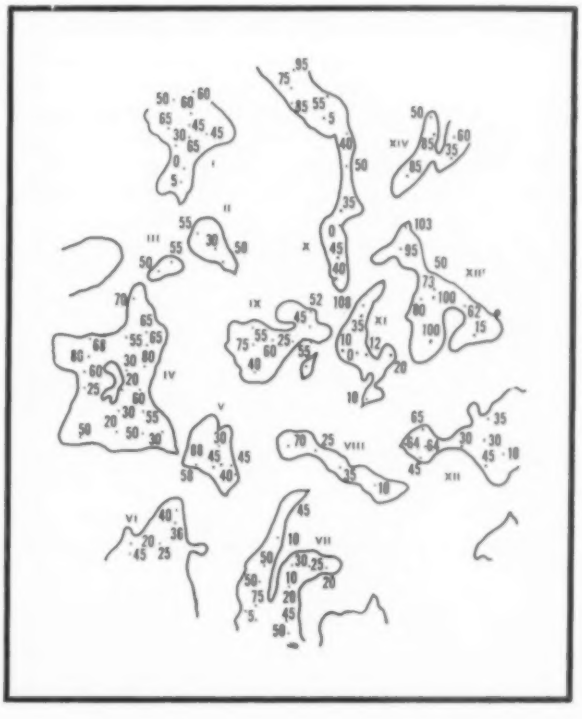
"Necessary finish grinding conditions to be observed are: absence of vibrations, adequate rigidity of units and machine as whole, good condition of the grinding wheel spindle group, possibility of realizing longitudinal feeds with uniform and smooth travel, additional filtration and cleaning with cooling fluid.

Surface finish measurements on a profilometer and interferometer microscope show that use of the fine finish method makes it possible to get class 11 and 12 finish, which is unusual for grinding with wheels of average grit size, in this case 46 to 60, electrocorundum in ceramic bond. After finish grinding, the work piece surface has a mirror smooth lustre without dull spots and burns."

The wheel trueing process for fine finish grinding described above was developed on research with diamond tools. While the new finishing method showed promise of very wide application in industry not only for cylindrical but also for internal, flat and other grinding, a drawback was the short supply and expense of diamond trueing tools. Therefore, the report stated, Russian research turned to study the possibilities of diamondless trueing.

The research in various trueing methods revolved around the variation in wheel face roughness characteristic of the methods used to dress the wheels. Grinding wheel faces were subjected to microscopic examination by means of stereogrammetric photographic instruments such as are normally used for deciphering the data of aerophotographic survey films. The object was to plot relief maps of wheel faces

• Figure 8. Grinding wheel surface after fine trueing by facing with diamond grain.



showing the height-differentials and distribution of cutting grains on the wheel surface. How this research was done is described as follows:

"Various areas of the grinding wheel are photographed through a binocular microscope with a special photographic adapter.

"The photographing is done directly on the grinding machine. With wheel grit size of 46, the photograph enlargement should be 25-fold. For better adjustment in picture definition, a 6 to 8 power magnifier is used in photographing. The magnifier is first adjusted to any surface, regulated to the best definition and then transferred to the etched glass of the photographic camera.

"Each wheel area is photographed through the right and the left drawtube of the microscope.

"For the purpose of developing the wheel surface relief, contour lines conforming to the cross section of the most projecting grain are drawn on the photographs by means of a stereoscope. The whole wheel face is thereupon seemingly dissected by a horizontal plane, above which various sections project. The relief projection was done at a geodetic survey agency. The correctness of contour line drawing is controlled by a precision stereometer on which further processing of the photographs is done.

This stereometric method was supplied to study the surface of a wheel measuring 15.7 x 1.97X 8 inches used in cylindrical external grinding, for the purpose of rating the quality of the trueing process. Diamond grain, hard-alloy wheels and abrasive wheel were tested for performance as trueing tools.

Contour maps of wheel face surfaces produced by the various tools used in trueing are shown in Figs. 8, 9, 10. The wheel surface quality rating was made in terms of what is called the "height-differential", i.e. the difference in height between the highest and lowest grains in the field of photographic vision, which varied from 20 to 110 microns. The higher ratings corresponded to class 9 finish, the lower to class 11 finish, when the trued wheel was used in finish grinding. The rating table is as follows:

TABLE 2

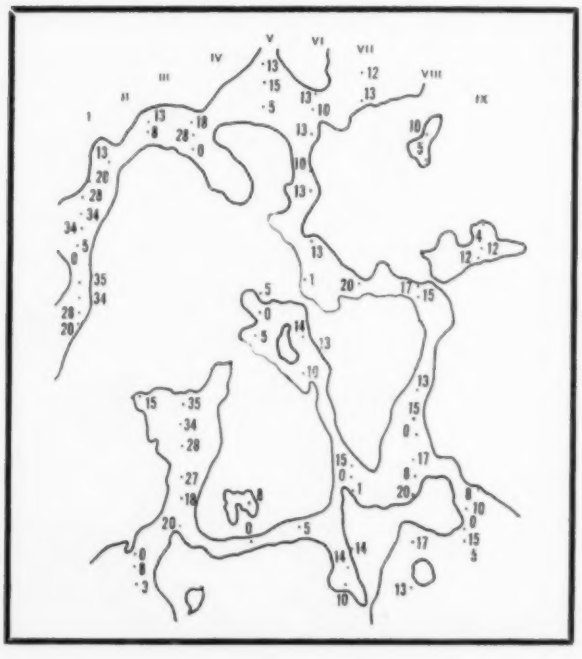
Trueing Tool	Trueing Method	Height-differential	Finish Class
Diamond-grain Abrasive wheel 3.94x1.26x1.26 in.	Usual grinding	100 microns	9
Hard-alloy wheel in holder	Usual facing	110 microns	9
Diamond-grain Abrasive wheel 3.94x1.26xx11.26 in.	Fine facing	50 microns	11
Hard-alloy wheel in holder	Fine grinding	20 microns	11
	Fine facing	60 microns	10

The possibility was thus established for using diamondless tools in trueing the abrasive wheels employed for the fine finish grinding method, and the way opened for "substantial savings in expensive and critical diamonds," the Russian report said. The following conclusions are drawn:

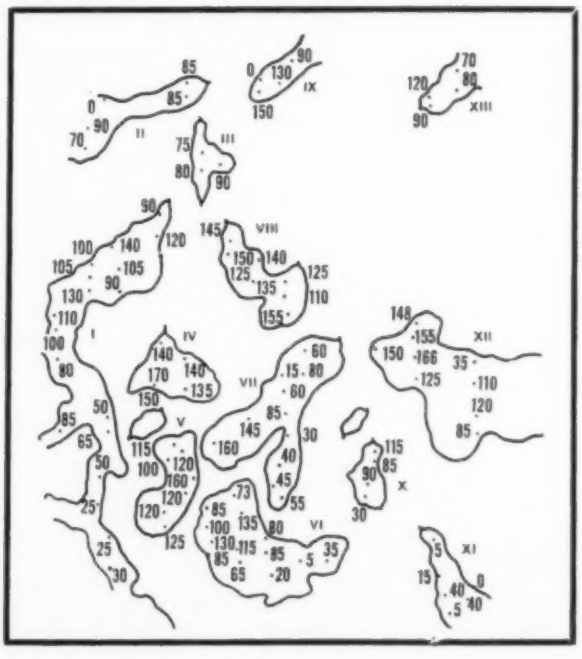
"(a) Trueing with facing by diamond and wheels of hard alloy produces grain form that does not differ in principle.

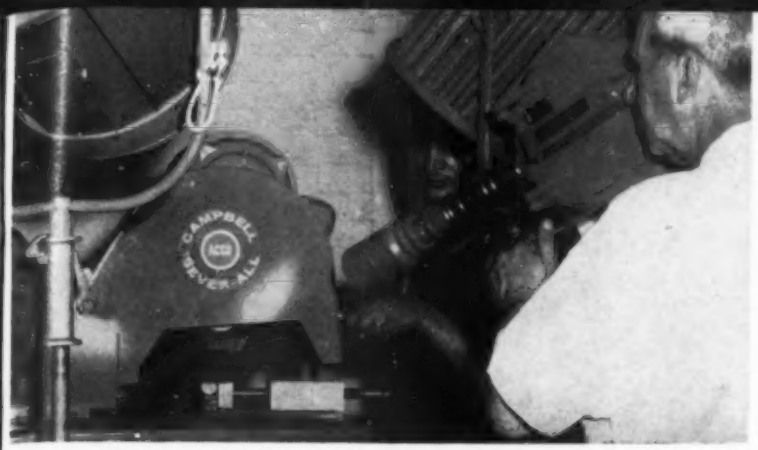
"(b) Trueing by grinding with an abrasive wheel causes dulling of grain tops, although grains are varied in height (however fine trueing by this method is inapplicable because both wheels are dulled by mutual grinding)." • • •

• Figure 9. Grinding wheel surface after fine trueing by grinding with abrasive wheel.



• Figure 10. Grinding wheel surface after fine trueing by facing with hard-alloy wheel in holder.



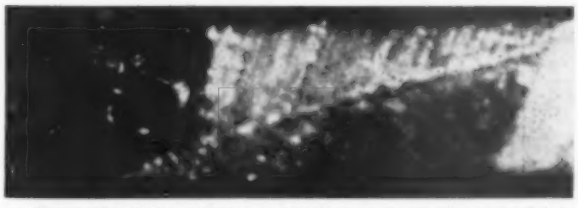


• The special equipment shown above makes it possible to take 16,000 pictures per second. Concentration of light equals two-thirds of the total candlepower of the four huge beacons atop Empire State Building.

High-speed photos show that steel forms tiny chips, while titanium is molten as it leaves the cut.

Abrasive Wheels Cut "Chips"

by HUGH V. ALLISON
General Manager, Allison-Campbell Division
American Chain and Cable Company, Inc



• Chips of metal cut by an abrasive wheel can be seen flying off to the left in the photo above. It was previously thought that abrasives cut through metal by plowing out metal in a near-molten state.

● On fingers of steel, man is searching for new ceilings, to push back the frontier of space and to bring its secrets into his living room. Every third word is "nuclear" as the search goes on to discover new metals and alloys, new metals to fabricate the skin of a guided missile or to hammer crankshafts out of white hot metals.

But with the discovery of new alloys and metals, the basic problems of handling and machining, of putting such metals to practical and economical use in the many fields which demand them, have continued.

From the pioneer methods of a generation or so ago, abrasive cutting has evolved into a major industrial application, providing a fast and economical method severing virtually all materials including high temperature, corrosion-resistant metals and alloys, some of which cannot be cut by other known means. Abrasive cutting is, in this manner, helping to meet the stringent demands of industrial growth in a nuclear age.

For a good number of years, metallurgists and scientists have believed that abrasive cutting was a discontinuous process. They had, however, no means of determining the truth of their beliefs. Now, close study of the cutting action of high speed abrasive wheels being used to cut sections of steel and titanium, utilizing motion pictures taken at 1/240,000 second and 16,000 pictures per second, has not only proved the theory as correct but has produced a variety of other valuable information. Filmed sequences clearly show that the cutting action is discontinuous and that there is a wide area in which to improve cutting action.

Through the ingenuity of the scientists and engineers at the laboratories of the Allison-Campbell Division, American Chain & Cable Company, Inc., a significant series of color motion pictures have been recorded.

To get a better definition of the true cutting action, using a film travel speed of 16,000 frames per second and Super Anscochrome color film, exposures were made with a special slit-aperture plate giving a 0.010" lens opening in an ingenious camera developed by the Fastax Division, Wollensak Optical Company. The 100-foot rolls of film, exposed at the incredible speed of 1/240,000 second per frame, were used up in 7/10 of a second each. Light, 800,000 candlepower strong, concentrated in a 3-inch circle spot, came from a 7.5 kw. Zenon lamp which was pulsed for a 2-second light-duration period.

It has long been held by metallurgists and machine-tool manufacturers that the minute particles obtained in dry-abrasive cutting methods, and observed under the microscope as solidified globules of metal, had been in a molten or near-molten condition as they became separated from the material being cut. Practically instantaneous pictures of this cutting action show this idea to be nothing more than a half truth.

Materials used for this series of tests, which were conducted over a period of several days, were SAE 1020 steel and pure titanium. Titanium showed a peculiar condition in that tiny globules of gaseous vapor, having a life of only a fraction of a second, were given off during the cutting. The difference in the character of the "chips" resulting from the two metals may be heavily influenced by the difference in heat conductivity.

Titanium, the jet age metal, is molten as it leaves the cut, while steel forms real chips. These chips, some ¼" to ½" in length, then seem to oxidize very rapidly in the air and appear to melt into metallic globules from their own heat of burning. Prior to this melting action, steel chips look as though they have been cleanly milled from the "mother" piece of metal.

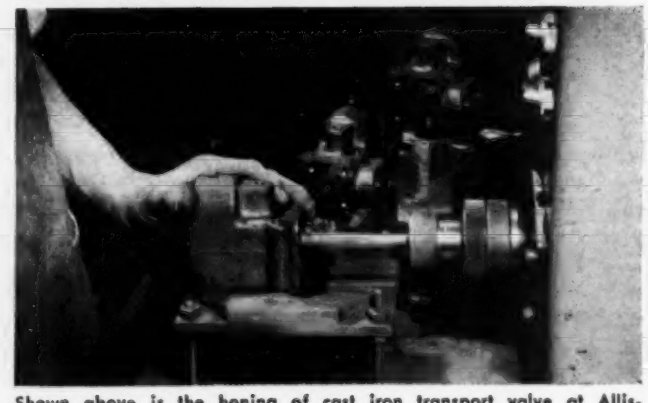
How will this research affect the design of abrasive cutting machines and their cutting wheels? Here are some of the possibilities.

(1) Machines must be designed to minimize vibration far more effectively than is now thought possible.
(2) Research must extend vibration neutralizing and machine dampening techniques.
(3) Wheels must be produced for more specific applications and materials conditions.
(4) Both the ingredients and mechanical structure of wheels must be controlled more closely to suit specific jobs. • • •

ALLIS-CHALMERS USES

New Diamond Dresser for Honing

New dresser for honing cuts stone usage from 8-10 sets per week to one.



Shown above is the honing of cast iron transport valve at Allis-Chalmers. The bore being honed is .495" in diameter, interrupted and 2¼" long.

The Tru-Hone dresser is simply passed over the stones until all the high spots are removed.

UPPER LEFT Two sizes of the Tru-Hone diamond dressers which are manufactured by Staples Engineer Corp. The inside bushing consists of metal bonded diamond particles.

● Bench type honing is a very popular method for finishing small bores. The machines usually consist of a horizontal spindle with the honing stock or stick forming a large percentage of the O.D. of the honing tool. A set of stones or abrasive sticks consists of two halves, and are supplied with a radius on the O.D. suitable to form the diameter of the bore to be honed, but require dressing and final sizing by operator. When there is ample stock left in the bore, a new set of stones can wear or dress themselves to shape without any difficulty. When the previous operation leaves very little stock, there is a problem. Just such a problem faced the staff at the Allis-Chalmers Manufacturing Company, West Allis, Wisconsin.

The part being honed at Allis-Chalmers is a cast iron transport valve. Honing of an interrupted bore .495" in diameter, 2¼" long to + .0002" and removing .0002" stock is the final operation. The bore has been diamond bored before the honing operation. The purpose of the honing operation is to remove .0002" stock and the burrs around the various ports and holes coming into the bore.

The practice of not pre-dressing the stones had caused the use of 8 to 10 sets of stones and difficulty in holding the tolerances and the 16 RMS finish.

It was at this point that Allis-Chalmers called in the manufacturer of the Staples Model B-5 honing machine which was being used on the operation. The Staples Engineering Company, Birmingham, Michigan, presented a diamond dresser for truing the stones previous to the honing operation. This dresser consists of a bushing of metal bonded diamond particles, and a steel ring into which the bushing is pressed. The inside diameter of the bushing is the same as that of the part to be honed. This very simple dresser can either be held by the operator or mounted on a fixture. In either case the stones are dressed quickly by stroking the dresser over the stones until all the high spots disappear. Thus the stones are trued and set to size with relation to the machine dial.

After using the True-Hone diamond dresser Allis-Chalmers reduced their stone usage to one set of stones per week. • • •

Ideas from the Shop

Rotary Cutter Modifies Grinding Wheels

By **H. J. Gerber**

● Periodically we find it necessary to modify a stock grinding wheel to make a special size or shape for emergency tool room and production work. These modifications might consist of simply making a narrow width wheel from a thick one (as illustrated), making a recessed wheel from a plain one, or radically reducing the diameter of a wheel.

The rotary cutting tool, mounted in a boring tool holder on the lathe, will do work as described above, very efficiently and costs but little to construct. This particular tool was ground to shape from a scrap H.S.S. circular form tool blank. It has simply been beveled off to a sharp edge on its periphery and a bronze bushing press fitted into the hole in its center. The cutter is mounted on a M.S. shank turned to a running fit in this bushing. A nut retains the cutter in place and the bearing is lubricated frequently while running.

As the grinding wheel is rotated at moderate speed in the lathe the cutter revolves against the work. Either hand or power feed can be used to traverse the tool. Cutting action is quite rapid and re-sharpening is seldom necessary as the edge is more or less self renewing.

The most effective angle to present the cutter to the work is best found by trial. ●

Pressure-Sensitive Tape Holds Small Parts For Grinding

● Double-sided pressure-sensitive tape solved a tough workholding problem in grinding brass feed discs at The Heald Machine Company, Worcester, Mass.

The parts are essential components of feed boxes for Heald internal grinders and must be ground to extreme flatness. Because the brass parts could not be held on a magnetic chuck they were held in place with steel strips. The complexity of the chucking operation held production to about 25 parts per hour.

Production men in Heald's reciprocating grinding department came up with an idea for using double-sided pressure sensitive tape to hold the parts. A trial showed it to be an ideal way to achieve the absolute flatness desired.

Not only did the tape simplify the chucking operation and reduce scrap to a negligible point but increased production 300 per cent. Parallelism is usually off slightly (about 0.0003-in.), but it is not an important factor in this part. The technique has proved so successful that it is also used in some cases for grinding carbide tools. ●

● Rotary cutting tool for modifying stock grinding wheels. Mounted on a lathe, as illustrated, it is an efficient means of changing the shape or dimensions of a grinding wheel. The tool shown here is being used to reduce the thickness of the wheel.

● Double-sided pressure-sensitive tape holds brass feed discs on magnetic chuck for grinding, increasing production 300 per cent.

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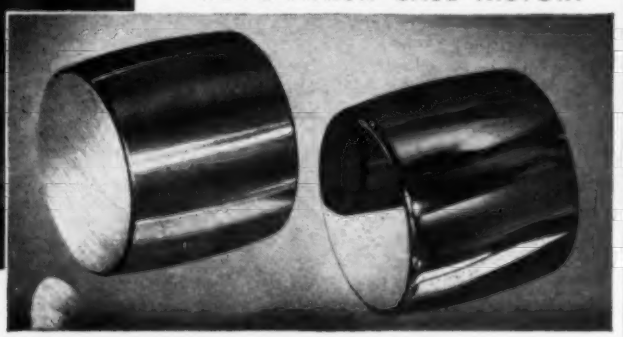
ROTO-FINISH CASE HISTORY



**This photo is unretouched.*

MATERIAL: Bearing steel, 61 Rockwell C Scale.
DIMENSIONS: 1.213" dia. x 1.015".
FINISH BEFORE: Ground to 10 RMS.
FINISH AFTER PROCESSING: 2 to 4 RMS,
(with no dimensional change).

Roto-Finish COMPANY

3730 Milham Road
KALAMAZOO, MICHIGAN
Phone: Fireside 3-5578

ROTO FINISH

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Ideas . . .

Sharpening Damaged Button Dies

By H. J. Gerber

● There are several methods by which dull thread dies of the "button" type can be re-sharpened along the whole length of the inside tooth faces. However, when the leading teeth on the die taper are badly chipped or worn—this is usually the area where the damage is most pronouced—the salvaging of the die is much more difficult.

We have had good success in re-sharpening these dies by the illustrated method: The die is held in a vise on the tool and cutter grinder and a flat faced dish grinding wheel is down-fed into the face of the die to notch the damaged teeth.

Notching damaged teeth of button die on a tool and cutter grinder with flat-faced dish grinding wheel.

The wheel is aligned just enough behind the tooth faces to clean up any damage. Depth feed is also made just far enough down to clean up the first three or four teeth, usually all that are in need of re-working. Position of the die in the vise is changed to repeat the notch-down on each of the four tooth groups.

This method has been used to salvage many dies of this type which formerly had been scrapped after extensive damage of this sort. ●

Grinding and Finishing

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What article in this issue interested you most?_____

What subjects would you like to see published in future issues? _____

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American Society for Abrasives

Boston Chapter—The Chapter recently had meetings on cutoff wheels by the Allison Co., Division of the American Chain & Cable Co., Bridgeport, Conn.; tumbling and barrel finishing by the Roto-Finish Co., Kalamazoo, Mich. Plans were scheduled for a January 27 meeting to be conducted by the General Electric Co., and the subject to be man-made diamonds.

Pittsburgh Chapter—At its Nov. 20 meeting the Chapter enjoyed a fine lecture by Norman Kendall of Cortland Grinding Wheel Co. on the basic facts of grinding wheel selection. Messrs. Beattie, DeBlander and Cramer were elected delegates to the annual meeting of the Society. Attendance was 48.

A Christmas party in the form of a dinner for members and their wives was planned for the Dec. 16 meeting at the Penn Sheraton Restaurant. The program was scheduled to be presented by the Bell Telephone Co.

Western Massachusetts Chapter—The December meeting was held at the Oaks Inn in Springfield, Mass., with an attendance of 38, despite sub-freezing weather and slippery roads.

The program was presented by Dr. Hugh Dyer of Behr-Manning, who dealt with the subject of the manufacture of coated abrasives, going into the questions of backing, coating methods, bonds, sizings and flexing, and also presented a color sound motion picture on the same topic to illustrate his remarks.

The January meeting was scheduled for the 19th at the Oaks Inn, with the program to be presented by General Electric and Carborundum on man-made diamonds.

Long Island Chapter—The December meeting was held the 10th at Wheatly Hills Tavern, Westbury, New York. Despite icy conditions, there were 31 members and 14 guests present. The following officers were elected: Pres., Bert J. Kemper; Vice-Pres., Paul Frick; Recording Secy., C. Honor; Corresponding Secy., H. Golden, and Treasurer, J. Urgo.

The next meeting, on man-made diamonds, was scheduled for January 14 at Wheatly Hills Tavern.

Executive Committee of the Boston Chapter—standing, left, Charles McQuarrie, General Electric Co., Lynn, Mass.; right, Philip E. Bloom, Gillette Safety Razor Co., South Boston, Mass.; seated, Raymond B. Ryder, General Electric Co., Lynn, Mass. on the left, John L. McAvoy, Waltham Grinding Wheel Co., Waltham, Mass. in the center and on the right, Richard F. H. Clancey, The Exolon Co., Wellesley Hills, Mass.

Detroit Chapter—The first annual dinner meeting was held December 4, with approximately 230 members and guests present to see Cal E. Edwards, President of the Chapter, turn over the reins of office to Emil Vogeley, President-Elect for the 1959 term.

The President commented on the great attendance record for the year, the rewards for being active in Chapter work and the privilege and honor of being President of such a fine up-and-coming Chapter. Lee K. Pruett, National Director, officiated in the ceremony, and charged Vogeley and his elected group of officers with upholding their accepted responsibilities and the by-laws of the Society, and administered the Oath of Office.

A presentation of an engraved watch was then made to Edwards as a remembrance of appreciation for his contributions to the Chapter.

An interesting program of entertainment highlighted the evening, with the drawing of many door prizes concluding the festivities.

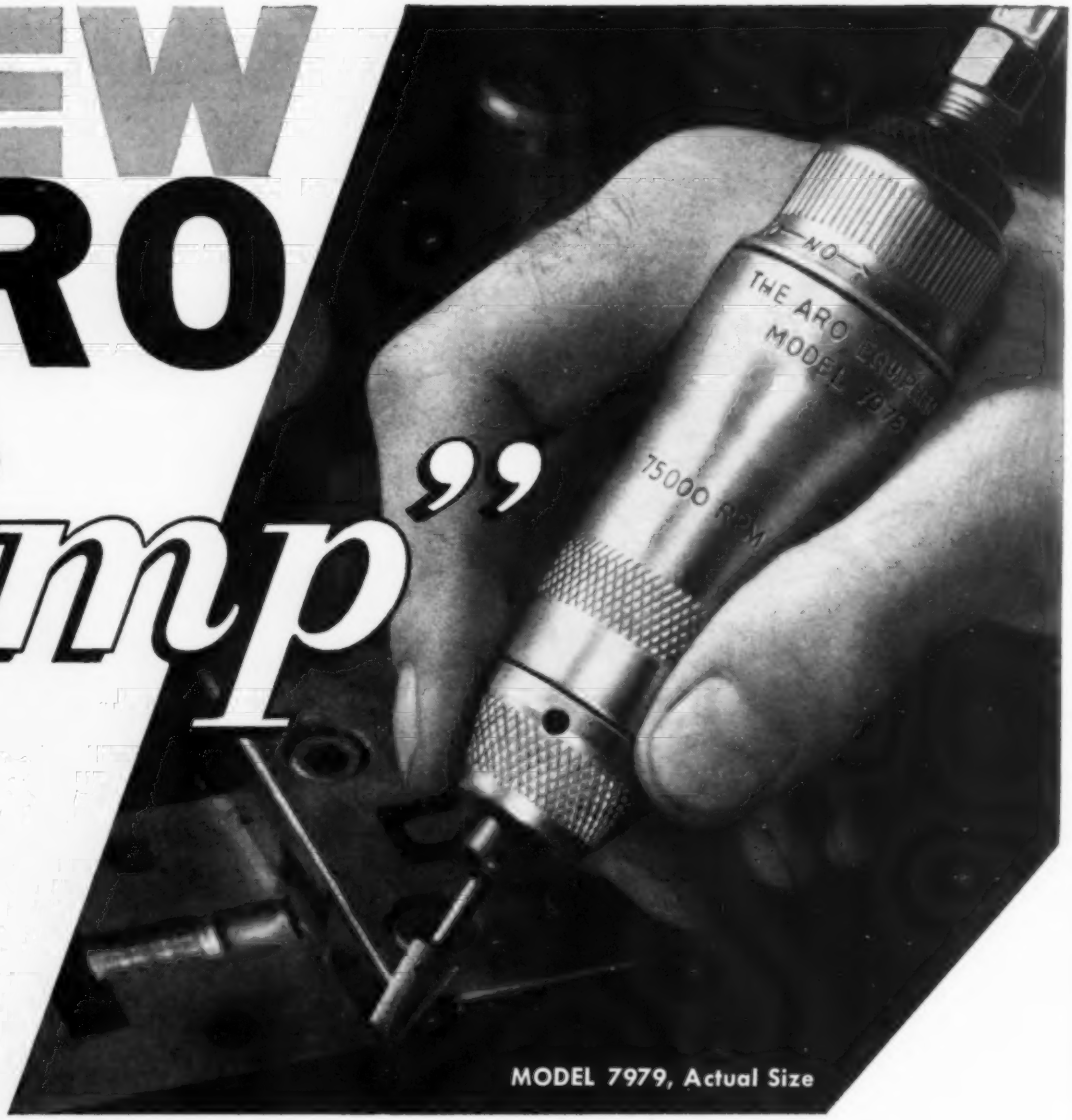
Programs scheduled include: Jan. 29, Gisholt Machine; Feb. 26, Stewart Analyzer; March, Plant tour, DeVlieg Machine Co., single point carbide tool sharpener, and April, Plant tour, Micromatic Hone.

Hudson-Mohawk Chapter—The Chapter held its January dinner meeting at Panetta's Restaurant, Menands, on the 12th. The group was addressed by M. M. Patterson, Managing Editor of GRINDING and FINISHING.

In his discussion of the abrasive industry, Patterson traced its development from the days before World War II when abrasives served chiefly for finishing up to the present time when as much as a quarter of an inch of material can be removed economically by abrasives. Citing recent Department of Commerce figures for machine tool sales, he predicted continued growth for the industry.

The new officers of the Chapter were introduced by outgoing President Emilio J. Niccolai of the Allegheny Ludlum Steel Corp.

NEW ARO "imp"



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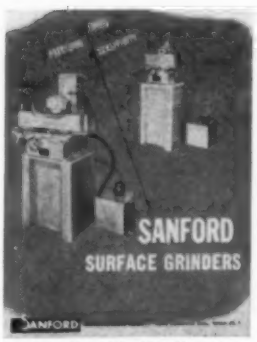
Literature



(See Number 1)

(See Number 2)

(See Number 3)

1. Surface Grinders. Booklet available pictures, gives construction details, and specifications of the Model SG bench surface grinder and the Model MG micro grinder. The 4"x8"x6" Model SG dry surface grinds dies, gauges, instrument parts and other small parts which would fit in the palm of the hand. Spindle speed is approx. 5500 rpm. The heavier duty Model MG handles large as well as small jobs, has a capacity of 8"x12"x12", with spindle speed approx. 3000 rpm. Optional equipment is illustrated and described also. Sanford Manufacturing Corp., 1020 Commerce Ave., Union, N.J.

2. Precision Tools. Bulletin M81 includes items entirely new in concept or advanced designs of personal and shop tools designed to provide greater accuracy and easier use than heretofore available. Convertible thimble micrometers with a range from 0" to 1" by .0001", height gages with new versatility and stability, a Super Hite Chek, self-contained transistorized unit that reads in 25 millionths, tool setting gages, edge finders, permanent magnet chucks and precision ground tool steel are some of the products featured. Specifications and prices are also included. Brown & Sharpe Manufacturing Co., Industrial Products Div., Providence 1, R.I.

3. Cutting Fluid. A new solution type cutting fluid, especially designed to replace cutting oils on heavy duty operations, is described in brochure PC-359 entitled "Cimcool Cimperial." The brochure explains the features of this new chemical solution, and also contains a chart of recommended dilutions. Cincinnati Milling Products Div., Cincinnati Milling and Grinding Machines, Inc., Cincinnati 9, Ohio.

4. Polishing Pads and Cloth. A new sample chart of polishing pads and cloth is being offered by J. I. Morris Co. Actual samples of Morris stock polishers are attached to this chart for easy visual selection, and working samples are offered free of charge when requested by style and size. Stock materials include all-wool, pitch and plastic impregnated, and vinyl plastic polishers for use on glass, metals, and for other finishing work. Data on each material is given in detail, together with prices and ordering information. J. I. Morris Co., Southbridge, Mass.

5. Hard-Gear Finishing is a new process for correcting the heat-treat imperfections (nicks, burrs, scales, etc.) of external gears, as described in Bulletin No. 999. Hard gear finisher Model 999 is the machine which does the job. Its capacities include: maximum abrasive finishing tool dia., 9¼" O.D.; tool spindle dia., 2¼"; maximum work gear dia., 12", and minimum work gear dia., 1½". The bulletin also covers machine construction and specifications, finishing tools, and the optional (interchangeable) equipment for finishing internal hard gears. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.

6. Auxiliary Tumbling Barrel, for batch wet blasting of small parts, is discussed in Bulletin 452-D. The use of a tumbling barrel permits large quantities of very small parts to be finished automatically. Although designed specifically for use in Liquamatte wet blast equipment, it can be adapted to other wet blast machines. Contained in the bulletin are complete operating instructions as well as mechanical and operating specifications. Techline Div. of Wheelabrator Corp., 1169 Avenue V, Vicksburg, Mich.

7. Two Cabinet Cloth Filter Dust Collectors. Information sheets describe Torit Models 64 and 66, compact, self-contained units in the 500 cfm range with a collection efficiency of better than 99.9% claimed, even with particle sizes smaller than one micron. Photographs illustrate internal design and typical applications of the collectors. The sheets also include multiple rating tables, complete specifications and a dimensional drawing. Dept. KP, Torit Manufacturing Co., Walnut and Exchange Sts., St. Paul, Minn.

8. Solid Polyurethane Applications. Based on a paper presented at the 1958 annual meeting of the American Society of Mechanical Engineers, new literature on solid polyurethane and its applications is now available. After a brief review of the basic processes involved in the fabrication of parts from solid polyurethane, the literature describes applications that have been made and used in industry. The method of preparing the raw material is discussed, and a physical description and case histories of parts successfully made from the material are treated. Marketing Services Dept., Disogrin Industries, Inc., 510 South Fulton Ave., Mt. Vernon, N.Y.

9. Contour Sanding Head. Literature available describes features of the Smooth-O-Matic contour sanding head. For use on wood or metal, the new design is said to permit greater control of scratch pattern with varying surface shapes. Both aluminum oxide and silicon carbide grits can be used in all grades. Descriptions and illustrations explain the heads' operation. They are available in stationary units or for portable hand tool applications, and are useful on automatic and automated machines in finishing of aluminum abrasions and other types of metals. Units range in abrasive widths from 2" to 50". Abrasive Machinery Corp., Dept. L-478, 444 So. Pennsylvania St., Indianapolis 25, Ind.

10. Felt Wheels for Polishing and Finishing. Tables, illustrations and descriptions help in the selection of the correct felt wheels, felt bobs and sheet felt for particular jobs. Wheels come in nine densities from extra soft up to flint hard. A helpful table aids the customer to determine the proper density for finishing various materials with headings as to metal, form, final finish, polish, finish needed and buff. Felt wheel specifications (in pounds and ounces) in face widths ⅛" through 4" and diameters 6" through 20" are given. Polishing and buffing

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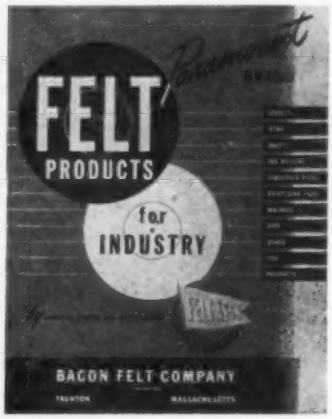
speeds are covered. Suggestions are written up for the care of the wheels



and other felt products. Booklet is available from Bacon Felt Co., Taunton, Mass.

11. "No Cycle Time Out for Wheel Dressing" is the title of folder on the application in industry of CDP (cemented diamond particles) cutters to the automating of production-line grinders. It is termed PFC (perpetual form control) grinding—a cooperative development by Jones & Lamson Machine Co. of Springfield, Vt.,

and Koebel Diamond Tool Co., 9456 Grinnell, Detroit 13, Mich. Except for handling, floor to floor time is now all actual grinding time. Its basic principle, the cutter and how it works, where to use the cutter, and applications are covered.

12. Flexible Shaft Machines and accessories, for "small-work" jobs of grinding and finishing, are described in Catalog 200. Manufacturer provides a choice of seven handpiece types (eight if eraser handpiece is included). All are illustrated and described. Three heavier duty models of flexible shaft machines of 1/10 hp, 14,000 rpm idle speed, lighter duty models of 1/15 hp, 14,000 rpm idle speed, motor chuck arbors, reducing chuck, accessories and accessory sets, are among the items covered. Price list on machines included. Foredom Electric Co., Inc., Bethel, Conn.

13. Surface Grinder. Bulletin covers specifications of the all-new 618 Micromaster surface grinding machine designed for rapid production of highly accurate surface grinding of small and medium-size work. Specifications cover the three basic models of the machine with hy-

(See Number 14)

draulic and hand longitudinal and hydraulic and hand cross feeds; hydraulic and hand longitudinal and hand cross feeds, and hand longitudinal and hand cross feeds. Brown & Sharpe Manufacturing Co., Providence 1, R.I.

14. Gage Blocks. Bulletin 8-3 covers briefly the types of gage block sets available from the manufacturer—rectangular and square, in steel and tungsten carbide. Tungsten carbide is used in sizes up through 1". Larger sizes are chrome carbide. The basic popular sets in composition and sizes are given, with a table on various grades with tolerances, included. Fonda Gage Co., Inc., Stamford, Conn.

15. Inspection of Surface Flatness. Folder available illustrates and describes the portable Cartrilamp with the efficient Cartriflat which speeds inspection of surface flatness. A feature of the instrument is the placing of the work on top of the flat—not under it. Bright, well-defined bands and improved monochromatic light source provide better visibility. The large 10" diameter Cartriflat is said to measure accuracies less than five millionths of an inch (0.000005"). Cartriseal Corp., 3515 W. Touhy Ave., Lincolnwood, Ill.

16. Hole Gage and Its Setting Fixture. Information on operation, application and cost of the PG-800 gage and PG-400 setting fixture is contained in Bulletin SSC-B1. Details include large size pictures of both units, as well as examples of how the setting fixture can be used to set the gage to dimensions of ½ tenths (.000050") without the use of masters, rings, or setting blocks. Sunnen Service Corp., Dept. B-16, 7900 Manchester, St. Louis 17, Mo.

(See Number 16)

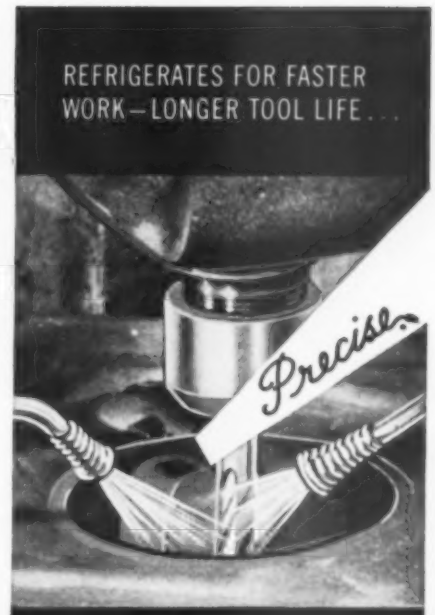
17. Tool Grinder. Catalog available includes illustrations and diagrams which point out the value of the Micropoint tool grinder, reportedly the first grinder capable of absolute control of tool geometry. Direct dial settings provide a method of accurate adjustment for each radius, angle, offset and clearance in exact accordance with the geometric requirements of the tool in a full range of sizes and shapes. Typical examples of single point tools ground on the tool grinder are included. Tool holders and accessories are available for grinding all sizes of Microbore units, square tool bits from ¼" to 1", round tool bits from ⅛" to ½". DeVlieg Machine Co., Fair St., Royal Oak, Mich.

18. Portable Grinders and Accessories. Bulletin No. 6065 covers the Hi-Torque Handee and Hi-Power grinders and accessories, giving complete information on the Handee and its many uses, operation instructions, and suggested applications. The completely illustrated catalog also shows mounted wheels, saws, brushes, cutters, drum sanders and bands which are available for use with the Handee. Chicago Wheel and Manufacturing Co., 1101 W. Monroe St., Chicago, Ill.

19. Polishing and Buffing Machines. 6-page catalog shows models available for continuous straight line, rotary or reciprocating action. Illustrations demonstrate automation is possible in the field of polishing and buffing. Conveyors for mounting single or multiple heads are clearly portrayed, along with types of standard buffing heads that are available. Also shown is the ease with which conveyors can be designed to feed from, or to, other operations. Wilson Buffing Chuck & Machine Co., 22730 Dequindre, Warren, Mich.

(See Number 17)

(See Number 18)



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Equipment and Materials

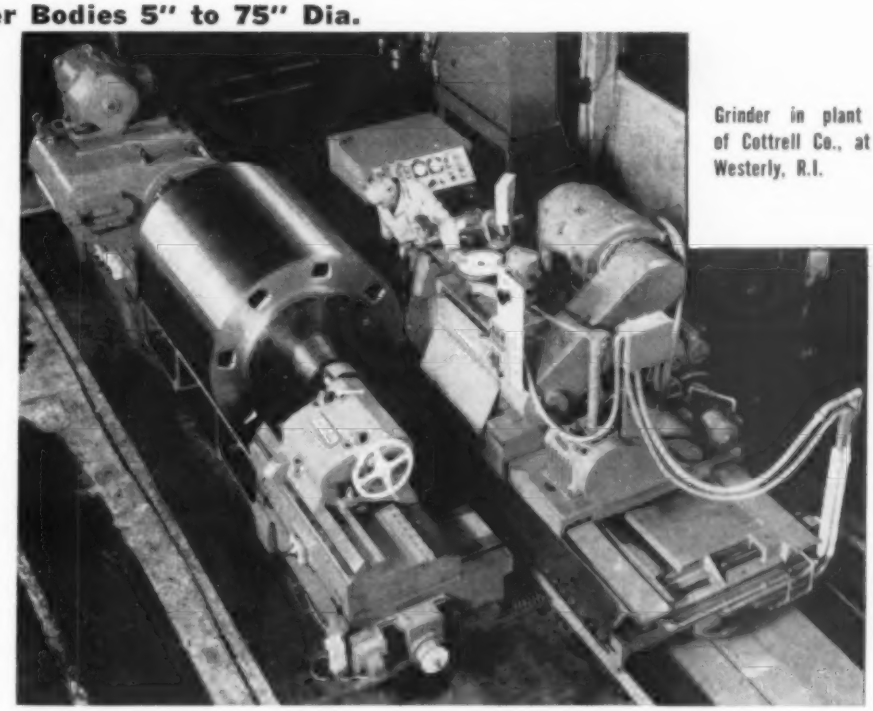
Roll Grinder Grinds Cylinder Bodies 5" to 75" Dia.

The Farrel HD type grinder illustrated is a moving-wheel type of machine, equipped with a 36" diameter wheel. Carriage reversal is controlled by micrometer adjustment and is accurate to within .005" for grinding up to shoulders. Concentricities of even the larger work pieces claim to be held to within .0002".

A large-diameter body and a small-diameter tapered journal can be ground with a single setup. Because the work piece does not have to be moved to perform these two operations, there is an important saving in time. Tapers can be ground in a range up to 30" in length and 1" per foot on the diameter.

With its wide capacity range—diameters from 5" to 75" and lengths up to 12' between centers—this machine is suitable for grinding many types of cylinders requiring accurate finishes. A gap-type bed accommodates the larger sizes of cylinders.

The headstock has infinite speed variation within a 10 to 1 range, which allows the selection of a suitable work speed for any diameter the machine can handle. The carriage and grinding wheel also have infinite speed variation through rheostat control.



Grinder in plant of Cottrell Co., at Westerly, R.I.

Controls for the machine are conveniently located at the operator's station.

Farrel Birmingham Co., Inc., Ansonia, Conn.

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Surface Plates Range From Small Flats to 7'x14'

A new line of precision granite surface plates and accessory equipment

now supplements Pratt & Whitney's gaging products. The new granite products range from small toolmakers' flats to large 7'x14' surface plates and include accessory items such as: granite layout, angle and T-slotted plates, parallels, and straight edges.

The precision granite plates and accessories are composed of California black granite that has been normalized and stress-relieved by nature through many centuries, and are said to hold their accuracy permanently with practically no maintenance. They repel moisture, shed abrasives, resist erosion, will not warp, and are washable with soap and water, the manufacturer claims.

Surface plate stands can also be furnished.

Pratt & Whitney Co., Inc., West Hartford 1, Conn.

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Vernier Magnifier

The Bausch & Lomb vernier magnifier is said to provide clear, sharp enlargement of scale lines for easier, more exact readings. Clear plastic body admits available room light. Two permanent alnico magnets are embedded in the base for attaching to metal scales.

The price is $2.50 each.

Bausch & Lomb Optical Co., Rochester, N.Y.

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clear the air for production

Dust produced by grinding, chipping and similar operations is removed as created by down draft dust control systems, pioneered by Kirk & Blum.

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KIRK & BLUM DOWN DRAFT DUST CONTROL

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Grinding Wheel Bond Used For Gray Iron Foundries

V9 Bond, a new vitrified bond for silicon carbide abrasive grinding wheels, is described as a chemically designed glass bond that produces a grinding wheel with a more uniform, fast-cutting action. It is claimed to be less susceptible to variation at high heat.

This bond has been adopted as standard for Simonds Electrolon vitrified bonded wheels as used on floor stand and portable grinders in the lower speed range not exceeding 6,500 sfpm. These wheels are best suited for grinding materials of low tensile strength such as gray iron castings, unannealed malleables, brass and bronze.

Popular sizes and shapes include the larger wheels for offhand snagging on floor stand grinders, and a wide variety of abrasive cones and similar shapes used on portable electric, pneumatic and flexible shaft machines.

Simonds Abrasive Co., Tacony & Fraley Sts., Phila. 37, Pa.

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Ultra-Fine Abrasive Powders

The Barton Mines Corp., producer of industrial abrasives since 1878, has announced the addition of ultra-fine classified abrasive powders to their complete line of Garnet abrasive grains and powders. Now in production are grades having an average particle size of four microns (W12) and three microns (W14).

These ultra-fine Garnet abrasive powders were produced from hard crystal gem quality Garnet. For use on metal, glass, plastics, etc., these grades meet the closest technical specifications, the manufacturer reports.

Barton Mines Corp., North Creek, N.Y.

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Surface Grinder for Close Tolerance Work

This extremely close tolerance surface grinder, for work on instruments, electronics and watches, features wheel

head elevation control which is said to read to .0001" by means of a vernier. Transversal vernier is reported to read to .0005". Very fine laminations on the magnetic chuck securely hold the smallest parts. There is a built-in demagnetizer.

The wheel head elevating mechanism is totally enclosed against grit and dirt. The spindle is mounted on four selected ball bearings and has provisions for automatically removing play.

Specifications include: magnetic chuck surface, 4⅛" x 6"; table travel, transversal, 4½", longitudinal, 8"; vertical movement of wheel head, 5"; diameter of grinding wheel, 4¾". The maximum height between chuck and wheel is 4". The height of machine is 230 lbs. without pedestal.

The American LIP Corp., Room 704, 610 Fifth Ave., New York 20, N.Y.

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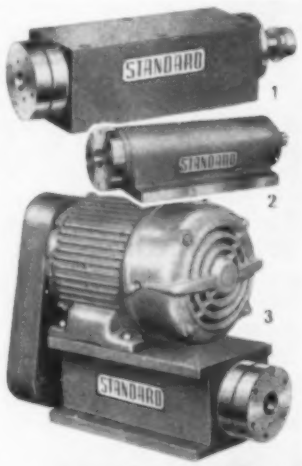
New Line Of Super Precision Spindles

A new line of rigidly and precision-built boring spindles are permanently lubricated and dynamically balanced, the manufacturer reports.

No. 1 in the illustration shows the No. 4308E block-type base. Item No.



2 is of the No. 4203 flanged-base, while No. 3 illustrates the No. 4407B piggy-back assembly.

These spindles, or the piggy-back assembly, are available in a standard design or custom-built to suit the individual requirements. They represent ideal replacement equipment for existing machines, or of value in the development of a new specialized type of boring machine assembly.

The Standard Electrical Tool Co., 2488 River Rd., Cincinnati 4, Ohio.

Use postpaid card. Circle No. 26

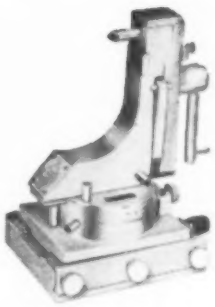
Cutting Fluid Does Not Foam Nor Get Rancid

Fibrecool, a water-soluble cutting fluid, is said to provide heavier cuts, higher speed machine operation and results in longer tool life. It is quick emulsifying and does not foam nor become rancid, the manufacturer claims. As the cutting fluid is transparent, it permits visibility of cutting operations.

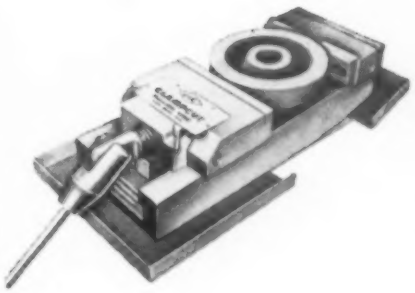
Fiske Brothers Refining Co., 129 Lockwood St., Newark 5, N.J.

Use postpaid card. Circle No. 27

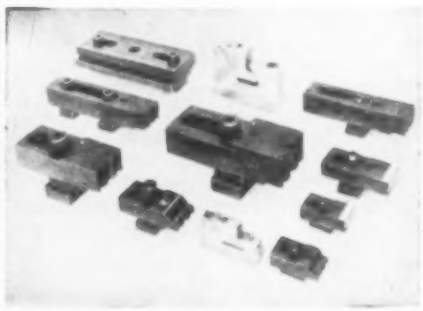
J&S DOWN-HOLDING DEVICES and WHEEL DRESSERS LEAD THE FIELD



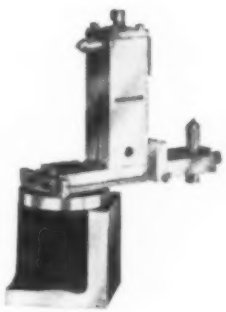
Fluidmotion Wheel Dressers—Dress two angles tangent to a radius, using ONE handle in one continuous motion. Operation is so fast and simple that beginners can use them. For all types cylindrical and surface grinders.



J & S Swivel Vise—The only hardened and ground swivel vise that mounts low, swivels, needs no pedestal. Patented down-holding clamping jaws give many times the holding power of an ordinary vise, yet only half the weight.



J & S All-Purpose Jaw Clamps — For any machine table or face plate. Five models—one adjusting screw has a holding force of 2½ tons on Small model, 12 tons on Jumbo model. Eliminate u-clamps, straps and fingers. No obstruction problems, no interference with measuring tool readings.



J & S Form-Master—Sturdy wheel dresser for shops with less frequent wheel dresser requirements. High quality, 100% dust-proof, it is capable of dressing any radii up to 12" convex, up to 15" concave.

Write for free literature and further information.

J&S TOOL CO. INC. — CLAMPCUT

J & S TOOL CO., INC.
880 DORSA STREET
LIVINGSTON, NEW JERSEY

Use postpaid card. Circle No. 223

Electrolytic Grinder for Carbide-Tipped Flat Tools

A vertical-spindle electrolytic grinder has been developed which is capable of high production with minimum wheel wear in the grinding of brazed-type carbide tools. The machine uses a 1500-ampere Anocut unit to supply the current required.

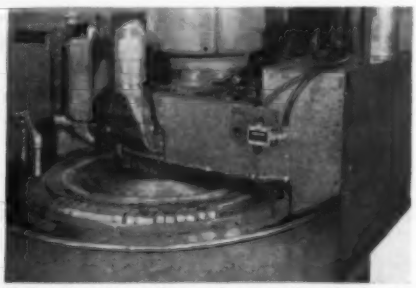
Surface finishes up to 6 microinches are obtained while taking off up to .012" of tungsten carbide in a single pass on the grinder, the manufacturer reports. Wheel wear is reported as reduced as much as 90% over conventional methods.

Wedge-shaped sections of magnetic chuck are energized just before work passes under diamond wheel, de-energized for easy removal and loading of work.

Electrolytic grinder has 1500 ampere Anocut unit.

The worktable has a speed range of 1.7 to 12 revolutions per hour and the spindle motor is 25 hp, 1800 rpm.

A small blower and a mist collector aid in keeping electrolyte away from the brushes and removing excess electrolyte vapors.



Wedge-shaped sections of magnetic chuck are energized before work passes under diamond wheel, de-energized for easy removal.

Capacity of the coolant system is 100 gallons. The coolant pump is ¼ hp, 1800 rpm, and can deliver 20 gallons per minute.

A limit switch stops rotation of the worktable if oversized stock is to be fed under the grinding wheel. The machine may also be provided with automatic sizing as optional equipment.

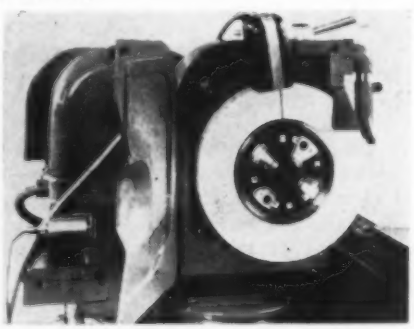
The diamond wheel used by the machine is 16" diameter, with a 4" face, and a 1/16" depth of diamond. It is a 100 grit, 100 concentration wheel.

Mattison Machine Works, 545 Blackhawk Park Ave., Rockford, Ill.

Use postpaid card. Circle No. 28

Electrodynamic System for Wheel Balancing

Careful wheel balancing is necessary to protect surface finish of workpiece being ground. This is possible with the Reutlinger Eltrodyn System which is said to increase balance accuracy, provide better surface finish, reduce the number of rejects and also protect the machine.



The system is suitable, according to the types used, to cover any weight of wheel, and speeds from 400 to 30,000 rpm, in special cases up to 120,000 rpm.

Any machine, old or new, can be fitted with the electrodynamic system. It can also be fitted to new grinders by the manufacturer. The system can be fitted to single machines or as many as eight machines can be controlled from one master unit.

Wharton Unitools, P.O. Box 202, Valley Stream, L.I., N.Y.

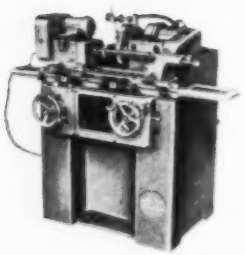
Use postpaid card. Circle No. 29

MSO

Precision
Cylindrical Grinders

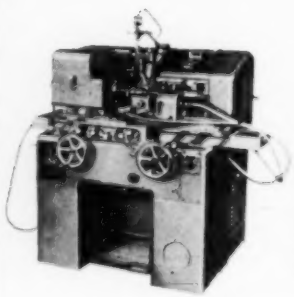
Since 1865 . . .
Pacemakers
for better grinding methods

Backed by continuous research
MSO Grinding Machines incorporate all modern refinements for
★ production to closest tolerances
★ fine finish
★ dependable performance



Model FMES
Universal Grinder
7" x 12" capacity

The MSO line comprises a full range of
Plain and Universal Grinders
capacities 7" x 12" to 22" x 138"
Crank Shaft Grinders
Thread Grinders



Model FH-200
Fully Hydraulic Semi-Automatic Cylindrical Grinder with Automatic Plunge Cut and electric gauge for automatic sizing.
Swings: 10"
Grinding Lengths: 15¾", 29½" or 39⅜"

FEATURES:
- patented adjustable spindle bearings for lifetime accuracy
- MSO pivoted internal grinding attachment insures maintenance of exact concentricity of O.D. and I.D.

OPTIONAL:
Automatic Sizing Attachment,
Copy Dressing Attachment

ASK FOR REFERENCES

austin industrial corporation
76-A Mamaroneck Avenue White Plains, New York

Use postpaid card. Circle No. 224

Permanent Magnetic Chuck for Small Parts Grinding

The Sanford CL permanent magnetic chuck, with finest Alnico magnets available, features maximum holding power for small parts and very close laminations. No chuck plate is required. The unit is poled in three sections.

Dimensions of the chuck are: 4½" long, 2⅛" high, 2⅜" wide.

Sanford Manufacturing Corp., 1020 Commerce Ave., Union, N.J.

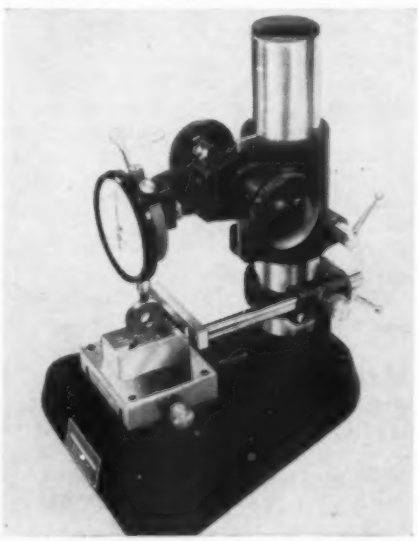
Use postpaid card. Circle No. 30

Comparator Adapts Any Dial Indicator

The Model A comparator, adaptable to all types of A.G.D. dial indicators, can be supplied with any of the 67 Em-re dial indicator models. Supplied alone, it can be equipped with an adapter to easily accommodate any dial indicator with conventional back. As a result, this comparator can be used for an extremely wide variety of precision measuring jobs with any A.G.D. dial indicator available.

An aluminum base on the comparator makes it light in weight and easy to handle, yet the unit is stable and rigid.

To prevent excessive wear in one spot, the stage is adjustable and reversible from front to back and, by rotating 90°, from side to side. It also has a ⅜" hole for mounting post-type anvils.



The comparator is equipped with a 1¾" diameter ground stainless steel column with 3⅜" clearance between column and contact point. Vertical capacity above anvil is 3⅝". Other models are also available with 5⅝" and 7⅝" vertical capacities.

Petz-Emery, Inc., Pleasant Valley, N.Y.

Use postpaid card. Circle No. 31

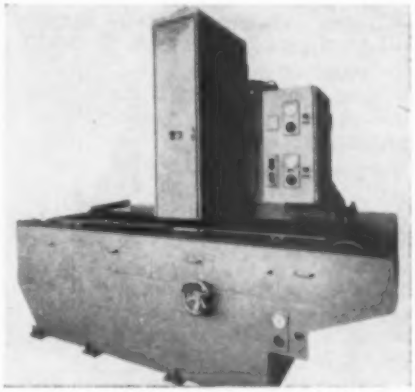
Flat Sheet Grinder

A new series of Engelberg conveyor-type models will belt-grind flat stock to extremely fine, micro-inch finishes, at continuous through-feed rates of from 10′ to 60′ per minute, the manufacturer claims. The single-head model shown, with 25 hp totally enclosed fan-cooled belt-driven motor, will accommodate sheet stock up to 22" wide, any length.

Other wide-belt models are available in various belt widths, with single or multiple grinding heads. For heavy stock removal and precision sizing requirements, machines are furnished with higher hp abrasive belt drives. Workpiece height capacity is 6".

Pneumatic tensioning of abrasive and conveyor belts, automatic tracking of abrasive belt, and a safety interlock mechanism which prevents operation in the event of belt breakage, are some of the features.

Specifications, for single-head 24" model illustrated, include: abrasive belt, 24"x126"; conveyor belt, 26"x269", with 1 hp variable speed motor; contact wheel, 9½" dia., 24" face; 147" long, 111" high, 90" wide.



Engelberg, Inc., 831 West Fayette St., Syracuse 4, N.Y.

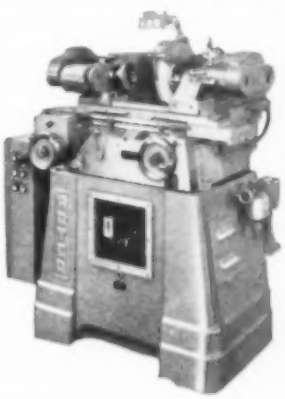
Use postpaid card. Circle No. 32

Proved grinder design that pays off in performance

Better surface finishes — smoother, more concentric — to meet the higher accuracy standards of today's industry are assured whenever a Sundstrand-Arter grinder does the job. Ease of control, simplicity of operation, and high work output mean lower grinding costs, too!

Cylindrical Grinding — Internal and External

This versatile machine converts simply by changing wheelheads and is suitable for toolroom or production work requiring a small capacity machine. Complete hydraulic movement of table and wheelhead, centralized pushbutton controls, and diamond wheeldresser with graduated dial are standard features. Maximum feed is .0005", minimum is .0001" at each table reversal. Maximum capacities are: External, 3" O.D., Internal, 3" I.D.



Rotary Surface Grinding

Compact, vertical design and rigid construction allows greater chuck pressure and greater stock removal. Machine has reciprocating table, rotating magnetic chuck of either 12" or 16" capacity, variable stepless speeds for chuck rotation and table traverse and manual or automatic wheelhead feed. Work table tilts for either concave or convex grinding.

Write today for details on these and other Sundstrand-Arter grinders.

SUNDSTRAND ARTER

SUNDSTRAND-ARTER Grinders

Division of Sundstrand Machine Tool Co.

ROCKFORD, ILLINOIS, U.S.A.

Use postpaid card. Circle No. 225

Grinding Machine Has Match Grinding Attachment

Hydraulically controlled and equipped with special electronic measuring controls, the Studer RHU-450 universal grinding machine is designed as a production machine for match grinding, internal and external grinding, and superfine and lap grinding.

The electronic measuring controls include a Movolimit electronic size control instrument for accurate grinding to a predetermined diameter from a master part or the first workpiece in the run, and a Deltalimit match grinding instrument for match grinding a shaft to fit a specific bore diameter.

Deltalimit equipment is useful for grinding servo valves, plungers and barrels, and other mating parts where tolerances in the millionths are required. The finished bore is placed on the measuring arbor of the Interlimit internal measuring unit. For automatic match grinding of the shaft to the bore, the grinding machine movements are then controlled as a function of the bore diameter and the pre-set clearance. Any deviation in the bore from nominal diameter is automatically compensated for.

On Movolimit equipment the grinding operation is controlled automatically in relation to the workpiece diameter, independent of grinding wheel wear.

Workpieces up to 18" between centers with 8" swing can be ground. Work spindle speed is infinitely variable from 30 to 650 rpm. Accessories are available.

Cosa Corp., 405 Lexington Ave., New York 17, N.Y.

Use postpaid card. Circle No. 33

Light Source Speeds Surface Inspection

The monochromatic light source, known as the Cartrilamp, when used in conjunction with the new, coated Cartriflats, is said to improve inspection speed and accuracy. It places work on top of the flat instead of under it.

The large 10" diameter Cartriflat permits many parts to be placed on it and inspected simultaneously. No

need to switch to smaller flats for checking smaller parts.

Cartriflats are said to measure accuracies of less than five millionths of an inch, and can be obtained in sizes smaller than 10" if desired. Cartriflats with center holes for inspecting shoulders on extended shafts are also available.

The bright, well-defined bands are easily read without eyestrain.

Cartriseal Corp., 3515 W. Touhy Ave., Lincolnwood, Ill.

Use postpaid card. Circle No. 34

Horizontal Grinders Have Speeds from 3100 to 12,000 RPM

A grinder with a 6" grinding wheel and wheel guard is being used in dressing weld prior to painting.

Electrolytic Metal Removal

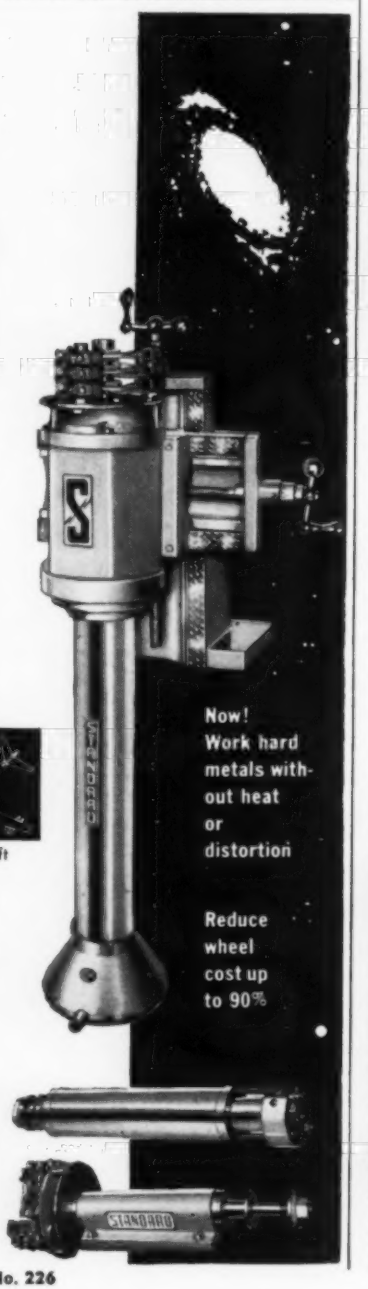
Potential Unlimited

This new procedure has solved hitherto unsolvable problems, and greatly increased capacity and quality in virtually every application.

As pioneers in this very "young" development, we can offer you real help in licking hard metal removal problems, with actual installation and performance data. **WRITE TODAY!**

Missiles | Tool & Die Ind. | Automobiles | Aircraft

Results depend on the spindle used. There is nothing finer in its field than a STANDARD Super Precision Spindle . . . available for electrolytic application in 50 to 3000 Amperes.



THE STANDARD ELECTRICAL TOOL CO.
Precision Spindle Division
2478 River Road Cincinnati 4, Ohio

Use postpaid card. Circle No. 226

The portable, pneumatic horizontal grinders are applicable to grinding, buffing, and wire wheel work. They have been designed for ease of handling and reduced operator fatigue in any metal removing or finishing operation.

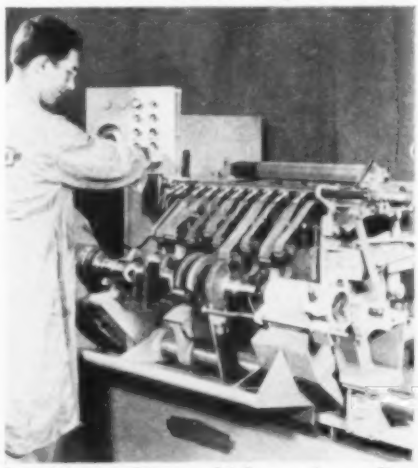
Various sizes and models are available, with speeds ranging from 3100 to 12,000 rpm. Wheel sizes range from 3" to 8" in diameter. Lever, straight, or grip-type handles may be specified.

Thomas C. Wilson, Inc., 21-11 44th Ave., Long Island City, N.Y.

Use postpaid card. Circle No. 35

Lapping Machine With Easily Reached Head & Foot Stock

The No. 31 Crank-O-Lap crankshaft



lapping machine, which produces fine surface finishes by means of coated abrasive strips, is designed for fine surfacing external diameters of automotive type crankshafts. It laps pins and bearings simultaneously in an automatic cycle to low micro-inch readings. The machine may be used to improve the finish on other types of parts also.

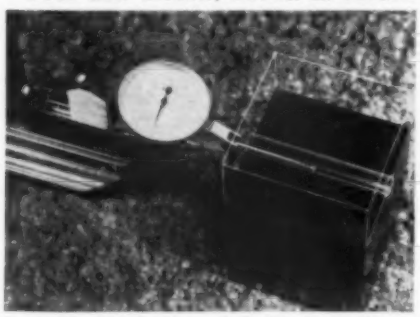
A swing frame mechanism swings the head and foot stock out at hand high level for operator convenience. The lapping arms need only be held in position for loading.

Norton Co., Worcester 6, Mass.

Use postpaid card. Circle No. 36

Long Contact Indicators Offer Deep Hole Work

Four new models, known as Models



L-15, L-16, L-19 and L-20, have been added to the Federal Series L Testmaster line. In addition to providing long range and high magnification, these models are equipped with extra long contacts for deep hole exploration in jig borer and surface plate applications.

The .080" ball tip contacts are either 1.446" or 1.497" long, depending on the model. All are graduated in .0005", have a total range of .080" (eight revolutions) and are available in either horizontal or perpendicular styles with either regular or large (1½" dia.) dials.

For more positive holding, these units are equipped with integral dovetails, rather than an end-mounted holding bar. They can be used with any of the holding attachments.

Federal Products Corp., 1144 Eddy St., Providence 1, R.I.

Use postpaid card. Circle No. 37

Water Soluble Concentrate Does the Job of Oil

Cimcool Cimperial Concentrate is a water miscible cutting fluid designed to perform the heavy duty, low clearance, low speed operations previously limited to cutting oils. It is reported to cover 95% of all metal cutting jobs. Mixed with water at dilutions ranging from 1:5 to 1:15, the cutting fluid can replace cutting oils on heavy duty operations, the manufacturer reports. The extreme pressure (EP) additives in the concentrate reportedly reduce the heat of metal cutting and permit faster feeds and speeds.

This cutting fluid will not turn rancid. It is also reported to prevent rust and counteract corrosion on all metals.

Cincinnati Milling Products Div., The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

Use postpaid card. Circle No. 38

ATLANTIC WHEELS

float through the roughest jobs...

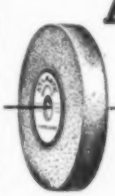
Even on the toughest flash and weld removal operations, you can depend on Atlantic Grinding Wheels for fast, cool, clean-cutting action. Made with a special resinoid bond to withstand high centrifugal forces and assure maximum safety, they have a smooth, floating action that calls for less pressure on the grinding surface . . . helps reduce operator fatigue and increase efficiency.

If you have any type of metal removal or smoothing problem, it will pay you to give Atlantic Grinding Wheels a trial run. An Atlantic representative will be glad to recommend the right wheel for your specific requirements. Write for details and a copy of the Atlantic Grinding Wheel Catalog. Atlantic Abrasive Corp., **532** Pearl Street, So. Braintree, Mass.

Atlantic Abrasive Corp.

A DIVISION OF ABRASIVE PRODUCTS, INC.

South Braintree 85, Massachusetts



STRAIGHT WHEELS • CYLINDER WHEELS • CUP WHEELS

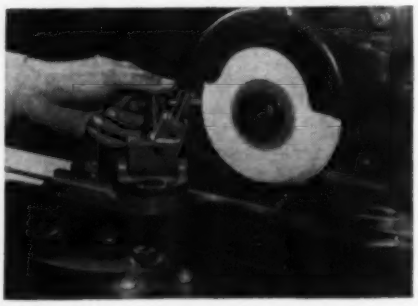
CONES • PLUGS • MOUNTED WHEELS AND POINTS

Use postpaid card. Circle No. 227

Angle Dresser Dresses at Various Angles

Dressing action of the manufacturer's angle dresser is obtained by rocking between centers. The centers do not permit dust, and have a take-up to acquire a snug "feel." Sticking, jerky or loose, chattering motion is said to be eliminated, resulting in fine micro-finishes. The unit can be left on the machine since it hinges down out of way to prevent collision with the grinding wheel. Operators' hands never get near the grinding wheel when using it.

The dresser with graduated base also locks in fixed position for dressing horizontally or under the wheel with the slide movements of the machine itself. The point swivels in any direction and raises up and down to match the center heights of any make of grinder.



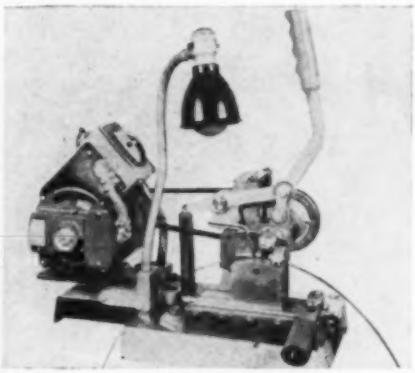
The dresser also lends itself to camroller grinding techniques, and can dress an arc in the wheel for radial relief sharpening.

The Steptool Corp., 3613 E. Olympic Blvd., Los Angeles, Calif.

Use postpaid card. Circle No. 39

High Speed Burring Machine

A high speed burring machine, an adaptation of the Rouse hand miller, is said to rapidly reduce any small weld flash to the exact dimension of the metal joined. It also smooths burrs from previous finishing operations and cleans out comparatively inaccessible places such as casting slots, the manufacturer reports.



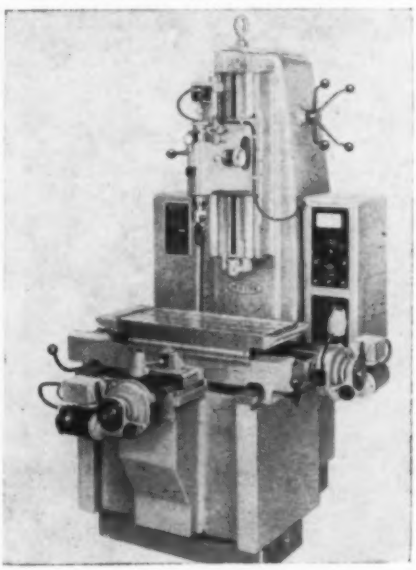
The Rouse hand miller is a high speed, ball bearing motor driven machine for handling light cuts in brass, aluminum, steel, plastics and other materials. Conversion into a high speed burring machine is by stepping up the spindle speed to 10,000 rpm, attaching a high speed carbide burr to the output shaft and adapting a fixture to accommodate the piece.

H. B. Rouse & Co., 2214 No. Wayne Ave., Chicago 14, Ill.

Use postpaid card. Circle No. 40

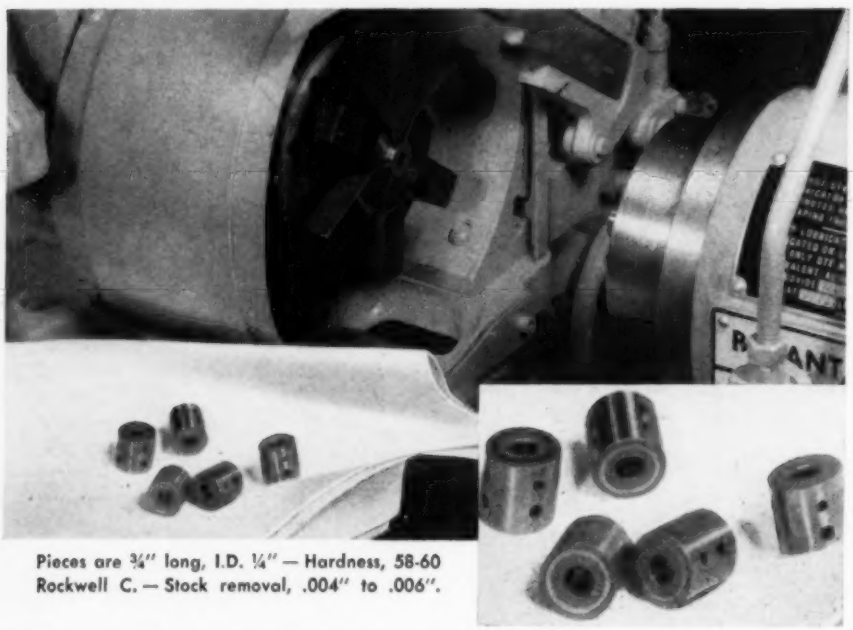
Measuring Machine Offers Motorized Lead Screws

The Moore universal measuring machine features motorized table position-



ing with accurate horizontal and cross lead screws. The motorized lead screw drive, illustrated in the photograph, is offered as optional equipment.

Designed to provide ultra-fine missile



Pieces are ¾" long, I.D. ¼" — Hardness, 58-60 Rockwell C. — Stock removal, .004" to .006".

Internal finish of 1 to 2 micro-inches, parallelism and roundness to within ± .000010" . . . produced by Bryant Chucking Grinder Co. with **W & B GRINDING CONCENTRATE 1500**

Bryant tested many coolants, wheels and spindle speeds in readying an internal grinder for exacting work on these parts at Hughes Aircraft Co., Tucson, Ariz. White & Bagley's Grinding Concentrate 1500 did the job best ...with a Norton 32A80MVBEM Abrasive Wheel, turning at 80,000 RPM. The job was so exacting the W&B 1500 was sent along with the machine.

W&B "1500" will help you too, in jobs as tricky as this or in routine production . . . yet costs as little as 1¢ per gallon of coolant! The foamless, transparent mix keeps wheels open, settles chips fast and provides excellent rust-protection. Send for complete information on amazing W&B "1500".

W+B INDUSTRIAL LUBRICANTS

THE WHITE & BAGLEY CO.

Worcester, Massachusetts · Detroit, Michigan

Originators of Grinding Lubricants

Sulphurized Fatty Bases
Grinding Coolants and Lubricants
Cutting, Grinding and Honing Oils
Forging Compounds

THE WHITE & BAGLEY CO., 88 Foster St., Worcester, Mass.
Please send me complete information on W&B Grinding Concentrate 1500.

NAME..... TITLE.....

COMPANY..... STREET.....

CITY..... STATE.....

☐ Attached letter describes particular problem on which we'd like advice.

Use postpaid card. Circle No. 228

era precision measurement and exacting inspection standards, the machine is suited for measuring large workpieces to laboratory tolerances. It is said to be capable of measuring to one-third of a tenth.

A work capacity of 11"x18"x18" in height, choice of an electronic indicator supported on a rotatable spindle, or a universal microscope for pickup are features of the machine.

When used in combination with the Moore ultra-precise rotary table, the measuring machine provides angular positioning accuracy compatible with the coordinate positioning accuracy of the machine table. The Moore microsine table extends this accuracy to compound angular settings.

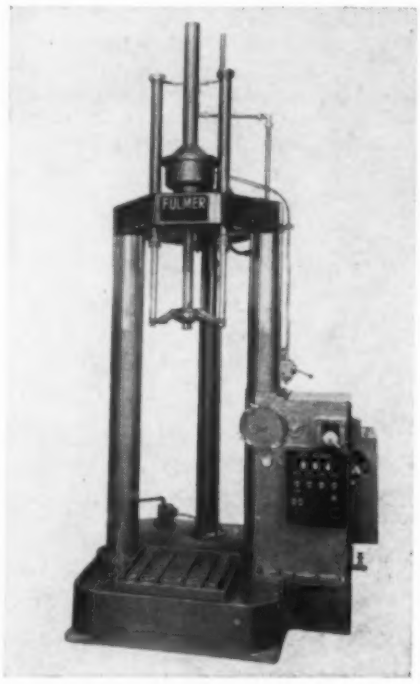
For longitudinal travel, the greatest error in any inch is 15 millionths, in 18", 35 millionths, the manufacturer reports. In the cross travel, the report is the greatest error in any inch is 15 millionths, in 11", 35 millionths.

Moore Special Tool Co., Inc., 800 Union Ave., Bridgeport 7, Conn.

Use postpaid card. Circle No. 41

Vertical Honing Machines Feature Automatic Control

Two additional series of vertical honing machines available are of the twin cylinder crosshead type, decreasing the over-all height of the machines. The Model 12 Series is available with up to 60" strokes and up to 25 hp, while the Model 18 Series offers up to 120" strokes and up to 35 hp.



Both series include as standard equipment the Fulmer Fulfeed system for control of honing tools. This system retains the many advantages of the mechanical brake-type honing tools, but with completely automatic and manual remote control of tool expansion and retraction.

The C. Allen Fulmer Co., 105 E. 4th St., Cincinnati, Ohio.

Use postpaid card. Circle No. 42

Honing Tool. The Dudgeon honing tool can be used without a special machine, and can be set up on a lathe, drill press, or grinder. The tool handles work in the range of 1/10" to 2¾". Stones are available in various sizes and grades. Economical stone expense, quick set-ups, and use of regular machine tools were the objectives of the designers. M. Dudgeon Co., 2011 S. English, Pittsburg, Kansas.

Use postpaid card. Circle No. 43

Spiral Twist Wire Wheel Brushes now have true dynamic balance (side to side) added to their balanced construction. Both sides of the reinforced flange are provided with a covering plate designed to make every brush run true even at the highest speeds. Locked construction in covering plates provides increased operator safety. Anderson Corp., 1029 Southbridge St., Worcester, Mass.

Use postpaid card. Circle No. 44

Direct Reading Cylindrical Square No. 558 is said to show variations from square in units of .0002" directly on the cylinder and eliminates the need for transfer instruments. The end of the 6" high square is lapped out-of-square so that when the cylinder is rotated, its angle with the base surface will at some point match the angle of the workpiece and shut out light against the work. Out-of-squareness is then read. Surface finish is 6 rms or better and diameter is ground and honed to within .0001". Brown & Sharpe Manufacturing Co., Providence 1, R.I.

Use postpaid card. Circle No. 45

How to make both ends meet ... and still cut finishing costs!

Time was when abrasive belt joints raised a rough problem in finishing circles. The early overlapping joints caused belts to rotate unevenly, chatter and mar freshly finished surfaces. Not so now! Today, Jewel Brand "Velvet Joints" have put the "smooth" back in smoothing operations. Jewel Brand Belt ends are neatly blended to form velvet smooth joints which permit an even flow of cutting surfaces and eliminate jumping. The result is a smooth, uninterrupted action that speeds up grinding, finishing and polishing . . . helps keep product finishing costs in line. A Jewel Brand Engineer will be glad to demonstrate these superior belts in action in your plant without obligation. Arrange for a free demonstration now. Write Abrasive Products, Inc., 517 Pearl Street, South Braintree 85, Massachusetts.

belts
rolls
sheets
discs
specialties

JEWEL BRAND

COATED ABRASIVES

ABRASIVE PRODUCTS, INC., South Braintree 85, Massachusetts

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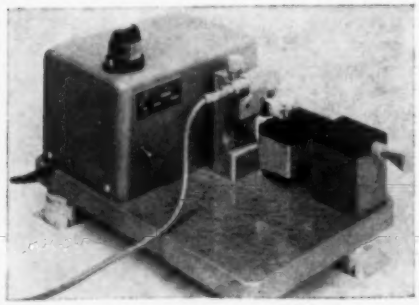
Surface Roughness on Balls

The portable RJ ball pilotor provides for accurate measurement of surface



roughness on all types of balls from 1/16" to 1½" in diameter, using only eight separate ball adapters.

Hoppers for fast production checking are available for use with the pilotor if required.

Each pilotor comes equipped with a specially designed bracket for holding a standard MA Tracer. Standard Profilometer Amplimeters of the types QA and QC are suitable for use with the pilotor.

Micrometrical Manufacturing Co., Ann Arbor, Mich.

Use postpaid card. Circle No. 46

Finishes Protruding Radii

The lightweight Peterson hand finishing tool is reported capable of producing approximately 4,000 sfm driven by an air motor, running at 17,000 rpm. This tool for finishing on protruding radii and convex surfaces is applicable to tool and die work, tool and fixture construction, spot metal finishing, and polishing on lathes and grinders, to name a few uses.

There are three usable sides: the nose which is adjustable for large or small radii, the long side used for larger radii and convex surfaces, and

the top, used for flat work. The tool is good for overhead use also.

Three abrasive belts, one drive sheave and one clamp for attaching air motor is included in the retail price of $32.00. A Keller model 30A17 air grinder motor is available for an additional $80.00.

Peterson Tool and Manufacturing Corp., Box 513, Okemos, Mich.

Use postpaid card. Circle No. 47

Cyclone Dust Collector Features Radial Fan

The Model 24 cyclone separator, operating in the 2,000-3,000 cfm range, has a self-cleaning radial fan designed to handle large volumes of bulky dust.

The 24 FM model is designed for outside exhaust. When it is desired to save heat and recirculate cleaned air,

BETTER PROFITS WITH KRAMER FINISHING EQUIPMENT

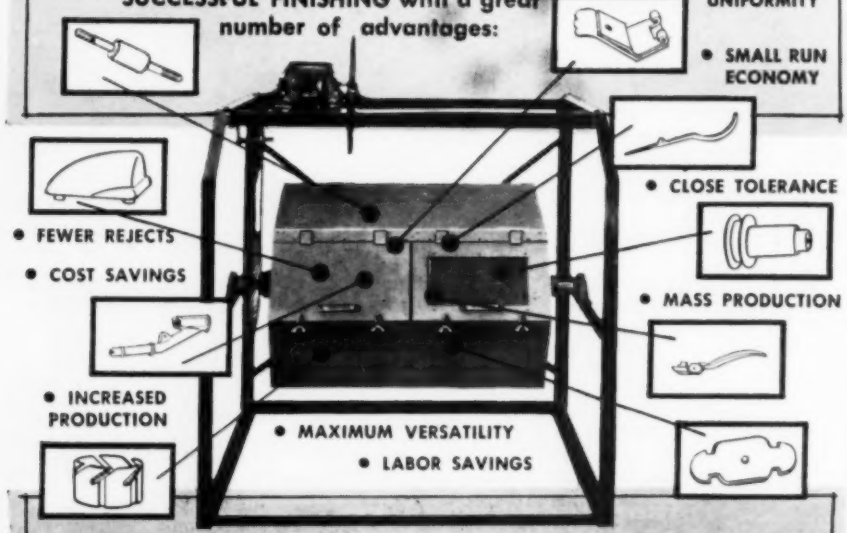
Development of New Methods Cuts Costs!

The greatest money-saving opportunities in Metal Finishing is yours now . . . in the use of H. W. KRAMER barrel Finishing!

Now, you can finish parts by the hundreds instead of the conventional methods that finish 1 part at the time. It's real easy work . . . it's childs play!

SAMPLE PARTS PROCESSED and a SPECIFICATION SHEET SUPPLIED TO THE MANUFACTURER.

Only Kramer's Tumblers & Buffers give you SUCCESSFUL FINISHING with a great number of advantages:



H. W. KRAMER solves any of your FINISHING PROBLEMS. Guaranteed prompt assistance in solving and determining the proper finishing procedure.

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Westwood, Mass.

FLORIDA REPRESENTATIVE
Ace Plastic Materials
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Miami, Fla.

Use postpaid card. Circle No. 230

FB models equipped with cloth after-filter bags are also available.

The radial fan is located on the clean air side of the system to eliminate possible fan damage from heavy material being separated.

Dept. KP, Torit Manufacturing Co., Walnut and Exchange Sts., St. Paul, Minn.

Use postpaid card. Circle No. 48

Machine Does More Effective Screening Job

A new design principle for more effective screening and separation of barrel-finished parts and abrasive media has been built into a vibrating type separator machine. A vibrating unit (completely shock-mounted), which imparts high frequency and low amplitude vibrations to the screening mechanism, is the main feature of the separator. This is reported to permit faster, more efficient separation and screening of processed parts, as well as rescreening of media sizes. It comes equipped with these screens.

The separator's adaptability to handle all standard screen mesh sizes is another feature.

A larger bed, with a screening surface measuring 18" wide and 48" long, presents a greater work area than that of earlier types.

Roto-Finish Co., 3700 Milham Rd., Kalamazoo, Mich.

Use postpaid card. Circle No. 49

Blasting Cabinet Has Two Blast Guns

A newly-improved double-duty blasting cabinet features two independent ceramic-nozzled blast guns. One is vertically mounted through the top of the cabinet and is controlled by a quick acting floor-level foot-valve. It has quick height adjustment.

The other gun, flexible and trigger-operated, is useful for the cleaning of small articles, crevices, angles and heavy objects.

The cabinet features a strong perforated-steel floor which screens the abrasive prior to automatic recycling. Available accessory equipment includes a work turntable and a dust exhaust blower.

Cyclone Sandblast Equipment Co., 42 Clara St., San Francisco 7, Calif.

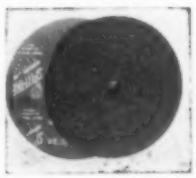
Use postpaid card. Circle No. 50

Coolant Concentrate. Coolie Coolant concentrate is produced in 6 oz. cans for refilling all vapor mist generators. This all-pure chemical coolant contains no oil or soap and is completely safe for operators. To prepare coolant, mix contents of can with one gallon of water. 55 6 oz. cans are packed in one container. Coolie Toolie Div., P.O. Box No. 1, Riverdale Sta., Dayton, Ohio.

Use postpaid card. Circle No. 51

Safety Spectacles. A universal bridge, which will fit more than 95% of employees without adjustment, is the feature of the Welsh Model 2200 Unibridge spectacles. Three temple styles: spatula, metal paddle and comfort cable. Three colors in butyrate frame: copper, cordovan and pink crystal. Lens shape and construction in S7 Square Shape clear or green heat treated glass and CR39 plastic. Eye size in 46 mm and 48 mm. Welsh Mfg. Co., 24 Magnolia St., Providence 9, R.I.

Use postpaid card. Circle No. 52



Aluminum Oxide Grinding Discs, called Spitfires, feature a special built-in shape control which is said to eliminate disintegration due to excessive grit loss. The solvent, waterproof discs are said to increase operating safety by as much as 25% over other types used on snagging operations. Available in special, standard and heavy duty models. Grit sizes are 16 thru 180. Dias. include 6", 7", 8" and 9⅛" with ½" and ⅞" arbor holes. Abrasive Products, Inc., Pearl St., South Braintree 85, Mass.

Use postpaid card. Circle No. 53

You'll get increased production plus greater versatility with a

Hammond UNIVERSAL BELT GRINDER

CONTACT WHEEL GRINDING

FLEXIBLE BELT GRINDING

This modern Hammond Universal Belt Grinder provides more ways of using abrasive belts on one machine than ever before. It can be used for a wide variety of grinding, polishing, buffing and deburring operations. This time-saving machine will speed up production and decrease labor costs on many operations in your tool room, machine shop, fabricating, assembly and other departments. Can be furnished as a bench or floor model, with or without built-in DusKolector. Many combinations available. Write for catalog.

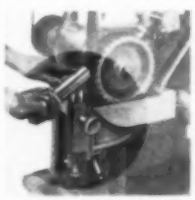


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TABLE & PLATEN GRINDING

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Model UBG-50 — Other combinations available.

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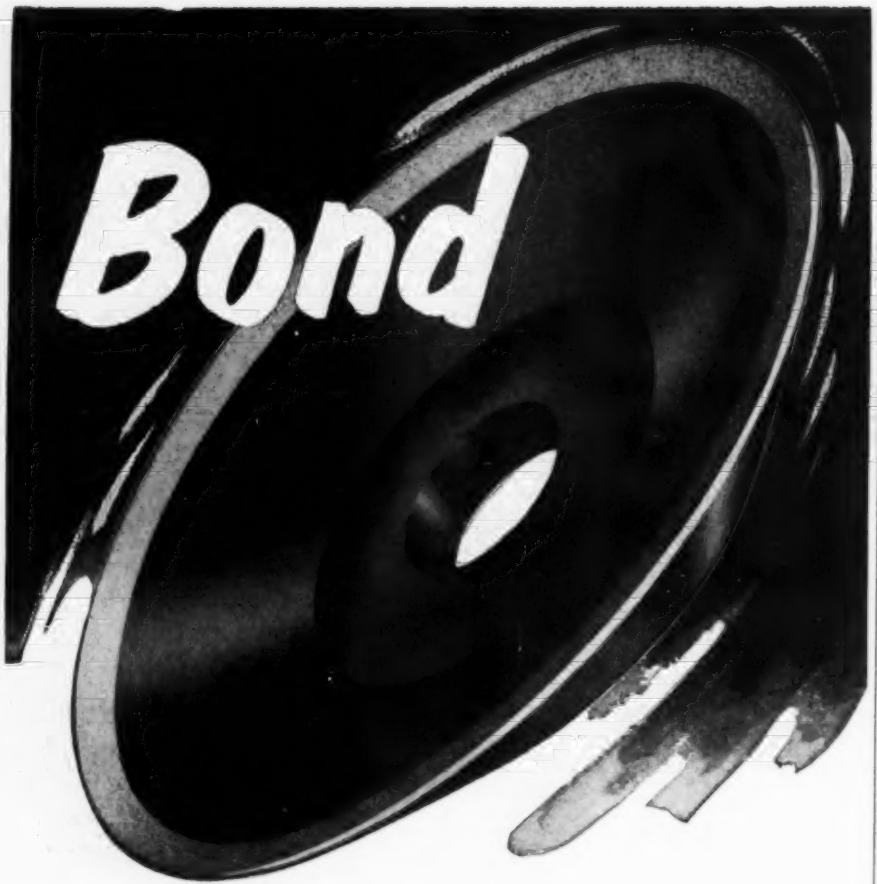

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Die Grinders Provide Vibration-Free Operation

Powerful three-bladed type air motors and air-cooled precision bearings on the manufacturer's portable high speed die grinders provide well-balanced and vibration-free operation. A silenced exhaust at the rear of the tools provides quiet operation. Both integral and remote type exhausts are available.

Die grinder with remote air exhaust is being used for a special fitting operation on a cage slot.

The grinders have been designed to speed operations wherever filing, grinding, cutting and polishing operations are involved. The tools are available in two sizes, with rated speeds of either 40,000 or 60,000 rpm. They are suitable for a wide range of wheel sizes.

Thomas C. Wilson, Inc., 21-11 44th Ave., Long Island City, N.Y.

Use postpaid card. Circle No. 54

Electrolytic Conversion Spindles

Replacing or converting existing spindles for electrolytic grinding on surface, tool and cutter, carbide tool and other grinders or applying these spindles to existing planers, milling machines, etc., is now possible.

Electrolytic metal removal, heretofore confined to the aircraft and carbide tool industry, has been expanded to many other grinding applications.

Electrolytic metal removal spindles are offered for operation up to 3000 amps and in various styles and sizes.

The Cincinnati Electrical Tool Co., 375 Mt. Hope Ave., Cincinnati 4, Ohio.

Use postpaid card. Circle No. 55

News from the Industry

Portable Clarifier Saves Over $200 a Month on Coolant

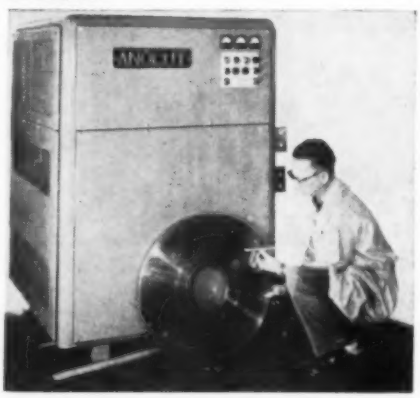
By cleaning grinding machine coolants in a portable centrifugal clarifier, it is reported the Hartford Screw Co.'s Greenville, S.C. plant saves more than $200 worth of coolant each month. Use of the clarifier, a 14 gpm unit made by De Laval Separator Co. of Poughkeepsie, N.Y., also eliminates frequent draining and filling of coolant sumps.

Portable clarifier at Hartford Screw Co.'s plant.

Used with a number of centerless and cylindrical grinding machines that finish aluminum spindles for textile mills, the clarifier is easily connected into the coolant return line. It operates continuously. The coolant need not be changed until it breaks down chemically. It is reported the amount of coolant saved has paid for the unit in its first year of operation. No maintenance was required during that time.

Hartford Screw Co. uses the clarifier for both sulphurized base and mineral oils. Since grinding wheel contaminants are removed, too, it is easier to control finish.

Electrolytic Grinding Wheel



Illustrated is a 26" diameter metal bonded non-diamond wheel, believed to be the largest of its type. Weighing 150 lbs., the wheel has an abrasive rim width of 9", with abrasive section ¼" deep. The wheel is to be used for electrolytic machining of the edges of super-alloy jet engine blades. The 1500-ampere Anocut electrolytic supply unit, manufactured by Anocut Engineering Co. of Chicago, will be connected to a special machine arranged for feeding the blades.

Hanchett Builds New Office

The Hanchett Manufacturing Co. of Big Rapids, Mich. and Portland, Ore. announce the construction of a new branch office, factory and warehouse located at Fifth Ave. So. and 31st St., Birmingham, Ala.

Complete stocks of all Hanchett products, such as saw sharpeners, knife grinders, saw swages and swage shapers will be maintained at the new branch and factory.

Diamond Abrasives, B74, Is Sponsored By Grinding Wheel Institute

New standards in the field of bonded abrasive products will be handled under project B74, Diamond Abrasives, instead of project B5, as small tools. This decision was made by the Mechanical Standards Board upon recommendation of a special committee set up by the Board.

Action by the Board came as a result of requests for two new projects, one on bonded abrasive products proposed by the Grinding Wheel Institute, and another on carbide cutting tools proposed by the Cemented Carbide Producers Association. (From **Magazine of Standards**, December, 1958).

American Standard on Diamond Dressing Tools

A recently approved new American Standard for Diamond Dressing Tools (B67.1-1958) is now available at $1.00 per copy from the American Standards Assn., 70 East 45th St., New York 17, N.Y.

Sponsored jointly by the American Society of Tool Engineers and the Industrial Diamond Assn. of America, this standard establishes standard shank dimensions of diamond tools used for dressing or trueing grinding wheels. Tools requiring special shaped diamonds are not specifically covered by the standard, but in many applications they are expected to conform to the standard.

Included in the standard are a designation system, nomenclature, and dimensions and tolerances for straight shank tools and headed shank tools.

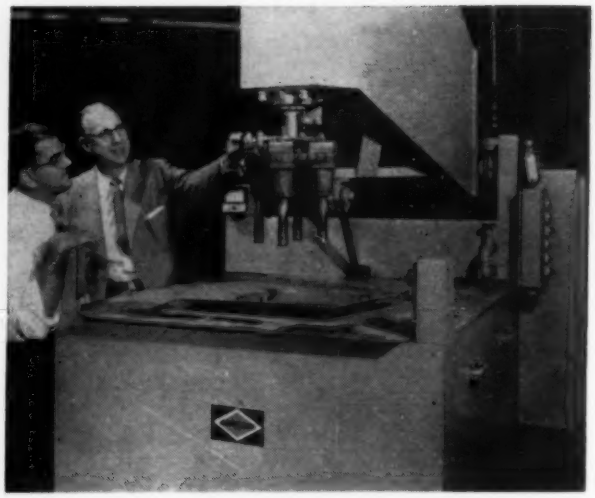
Particle Size Analysis Service

Particle size distribution data is being made available by Particle Data Laboratories, Inc., P.O. Box 265, Elmhurst, Ill., through use of the new technique known as the Coulter Principle. This principle involves high speed electronic counting of particles at different size levels with a Coulter Counter.

Particles as small as one-half micron can be counted successfully. Counts are made at rates up to 5,000 per second, thus producing data with excellent statistical accuracy. By counting at several different size levels, data for a complete distribution curve can be obtained in a matter of minutes.

The analysis service is being furnished for analysis of many different kinds of materials, including pigments, latices, emulsions, ceramics, ores, portland cement, wheat flour, foods, abrasives, to name a few materials.

Abrado-Matic Finishing Machine



Shown inspecting a recent installation of the new Abrado-Matic mechanical finishing machine are **R. E. Kimmer**, Plant Process Engineer of one of Michigan's largest auto industries, and **P. W. Sheppard**, right, of Abrado Finish Corp., Grand Rapids, Mich., manufacturers of the machine. The Abrado-Matic Model TS-31 is shown here fitted out for de-burring highly-precisioned bearing sleeves.

The Abrado-Matic process involves one or more parts being attached to a fixture holding spindle which automatically lowers into a rotating tub of abrasive media. At the end of a predetermined cycle, the spindle rises and parts are sprayed with a cleaning solution. One operator controls the entire operation.

Gulton Markets High Purity Aluminum Oxide Powder

Gulton Industries, Inc., of Metuchen, N.J., has announced it will market bulk aluminum oxide as well as formed aluminum oxide shapes. "It is being offered at a guaranteed purity of 99.96%," Robert Cunha, Division General Manager, stated, "with average particle size measuring 0.2 and 0.3 microns. The largest initial industrial application for the high purity aluminum oxide is in the field of ceramic cutting tools, which cut faster than comparable ceramic and carbide tools. Efficiency is 4 to 16 times greater and they have a longer life," Cunha added.

Additional applications for the aluminum oxide include vacuum tube cases, radomes, antennas and high temperature electronic components.

AIME Metallurgical Society Honors 3 Men at Feb. 15-19 Meeting

Three of the nation's top men in their fields have been named by the American Institute of Mining, Metallurgical, and Petroleum Engineers to receive, at its national convention in San Francisco, February 15-19, 1959, major honors sponsored by The Metallurgical Society, a constituent organization of AIME. They are Dr. Clarence E. Sims, recently retired as Technical Director of Battelle Memorial Institute, Columbus, Ohio, and now a consultant to the Institute; Dr. Frederick Seitz, Head of the Department of Physics, University of Illinois, particularly noted in the field of theory of solids and nuclear physics, and Clarence Taylor Marshall, of Sewickley, Pa., Vice-President and General Manager, Coke and Iron Division, Pittsburgh Coke & Chemical Co.

American Buff Sets Up New Machine Shop

A modern machine shop to create and manufacture special tools and parts for the methods and machines which carry out the new buff-making operations has been added to American Buff Co.'s plant in Chicago. For example: an intricate facer-trimmer machine producing absolute diameter control eliminates inbalance and consequent extra centrifugal force exertion in high-speed buffs.

FREE TRIAL OFFER
NO STRINGS ATTACHED

A VALUABLE KIT
Carton contains 6 grades of ultra-fine quality, assorted fine grit abrasive compounds suitable for a variety of work. Coarser grit compound can also be supplied.

6 LIBERAL JARS DIFFERENT GRADES

FOR PRECISION LAPPING

Here's a get-acquainted offer you cannot afford to miss. Among these samples will be found the answer to many a tool room lapping problem. Hard and soft abrasives for all kinds of lapping needs. Sent post paid anywhere in the U.S.A. and Canada.

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OFFER LIMITED to those writing on company letterhead

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YOU'D BE LATE, TOO, if you had the trouble I've had in my toy shop. We never had such a demand—rockets, space ships, burp guns—I thought we'd never make enough. You can bet that we'll use Threadwell Cutting Tools next year so our production will run smoothly. And can you imagine . . . those wiseguy reindeer want overtime. *Photo by Cobb Shinn for Threadwell Tap & Die Co., Greenfield, Massachusetts.*

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Wheeler, Sr. Resigns As ACCO Board Chairman

Wilmot F. Wheeler, Sr., active for more than 42 years of continuous service with the American Chain & Cable Co., Inc., has resigned as Chairman of the Board and as Chairman of the Executive Committee. He will, however, continue as a Director and as a member of the Executive Committee of the Corporation. Wheeler, Sr., a resident of Southport, Conn., began his career with ACCO on October 1, 1916.

Wilmot F. Wheeler, Jr., Vice-President of the firm since 1955, has been elected Executive Vice-President and a Director of the Corporation.

Oakite 50 Years In Industrial Cleaning

Continuing research and in-plant service are essential to progress in industrial cleaning, according to Oakite Products, Inc., of New York, which celebrates its 50th anniversary in February.

It was research that gave David C. Ball the idea that led to the founding, in February 1909, of the Oakley Chemical Co., to help solve the critical industrial cleaning problem.

Today, Oakite's family of cleaning compounds and chemical specialties numbers about 150, ranging from pickle control solutions for acid baths in steel processing to phosphate coatings for metals and compounds for decontaminating surfaces subjected to radioactivity.

Oakite's laboratories today occupy 30,000 sq. ft. of well-equipped space, manned by experienced chemists and technicians. They cover the broad field of surface chemistry, developing an average of twelve new products a year.

Abrasive Machine Line Acquired by Landis Tool

A full line of precision surface grinders, previously manufactured by the **Abrasive Machine Tool Co.** of East Providence, R. I., has been acquired by the **Landis Tool Co.** of Waynesboro, Pa.

Manufacturing will be transferred to the Waynesboro plant.

J & S Tool Co., Inc., Livingston, N.J., announced that the **American Coldset Corp.** of Teterboro, N.J., has been appointed national distributor and exclusive sales agents for the J & S Contour Dresser for cylindrical and surface grinders.

Roto-Finish Co. Acquires Metal Finisher, Ransohoff

Roto-Finish Co. of Kalamazoo, Mich., manufacturers of precision barrel finishing machinery, has purchased **Ransohoff, Inc.**, Hamilton, Ohio, who manufacture metal finishing, phosphating, pickling and paint finishing systems.

Gunther W. Balz, President of Roto-Finish Co., is President of the combined companies. **R. E. Wigger**, Vice-President of Ransohoff, Inc., will be in charge of the Ransohoff operations as Executive Vice-President of the new Ransohoff Co.

Raybestos-Manhattan, Inc., announces the moving of its San Francisco district warehouse and offices from 131 Mission St. to new and larger quarters at 168 Beacon St., South San Francisco, Calif. The divisions now represented there include: Manhattan Rubber Division, Raybestos Division, Packing Division, Asbestos Textile Division, and Plastic Products Division.

Natco Purchases Jes-Cal

The National Automatic Tool Co., Inc. of Richmond, Ind., has purchased The Jes-Cal Company of Fraser, Mich., manufacturers of honing tools.

Natco, builders of multiple spindle machine tools, plans to develop, build and sell a machine of advanced design to utilize the size control honing tools manufactured by Jes-Cal.

Directors and officers of Natco's wholly owned subsidiary are **W. H. Bockhoff**, Chairman of the Board; **N. M. Forsythe**, President; **C. P. Smith**, formerly Chief Engineer of Jes-Cal, Vice-President and General Manager; **R. C. Schuerman**, Treasurer; and **R. C. Gildenhar**, Secretary and Assistant Treasurer.

F. J. Jeschke and **G. M. Calvert**, pioneer developers of honing tools and former co-owners of Jes-Cal, will remain with the company and have been appointed Vice-Presidents.

You never knew you could do so many things with MODERN ABRASIVES!

Say goodbye to many older, costlier metalworking methods

Today, use Brightboy, the modern finishing medium that will perform many types of work previously unrelated with abrasive uses.

Brightboy's wide scope begins where conventional abrasives leave off. It's unique working action results from rubber and Silicon Carbide or Aluminum Oxide abrasive grains working simultaneously: BURRING, CLEANING, FINISHING, POLISHING, *in a single-step operation!* Readily available STOCK grains and textures are JOB-MATCHED to *your job!*

TIME-SAVING FEATURES

Works to close tolerances
Can be shaped to contour
Produces conventional and special finishes and patterns, frequently the final polish
No before-use preparation or dressing
No skilled labor required

GENERAL USES

Removing light digs, tool and heat marks
Cleaning welded and soldered joints
Burring and finishing castings, stampings, machined and molded parts
Maintenance of tools and machinery

WRITE US *NOW* FOR:

- SAMPLE BRIGHTBOY HAND TABLET
- CATALOG LISTING GRAINS, TEXTURES, MACHINE SPEEDS
- NEW METHOD RECOMMENDATIONS and for name of nearest Brightboy distributor

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WELDON ROBERTS RUBBER CO.
95 North 13th Street Newark 7, N.J.

America's Pioneer Manufacturer of Rubber-Bonded Abrasives

WELDON ROBERTS Brightboy RUBBER CUSHIONED ABRASIVES

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R. Lehr

F. F. Miller

G. W. Speer

A. H. Jones

H. M. Richey

L. J. Mackell

Gear Grinding Machine Elects Lehr President

Roland Lehr has been elected President of Gear Grinding Machine Co., Detroit. He has served as a director of the company since February, 1958.

Lehr will continue to serve as President of Baker Bros., Inc., Toledo machine tool builder. Since heading Baker Bros. in 1956, he has carried out a complete reorganization of the 80-year-old machine tool firm.

There will be no other changes in the management of Gear Grinding, and the two companies will operate completely independently, Lehr announced.

Ordnance Society Names Louis Polk President

Louis F. Polk, Vice-President and Group Executive of Bendix Aviation Corp. and President of The Sheffield Corp., Dayton, O., was elected President of the American Ordnance Association at the annual meeting of the Association's Board of Directors.

Promotion of **Fred F. Miller** to Vice-President in charge of engineering was announced by the Gear Grinding Machine Co., Detroit, manufacturers of automatic gear grinding machines and constant velocity universal joints.

Miller formerly was Vice President of Detroit Bevel Gear Co., until recently a Gear Grinding subsidiary. He started with Gear Grinding in 1934.

Gareth W. Speer has been named Vice-President-Finance of Solar Aircraft Co., San Diego, Calif. He was formerly Vice-President and Treasurer of Vertol Aircraft Corp. of Morton, Pa. Speer joined Vertol in 1951.

Allen H. Jones has been elected Vice-President, Sales and Engineering, of the W. W. Sly Manufacturing Co. For the past three years he has served as Director of Engineering of the Cleveland manufacturer of dust control systems, industrial ovens, blast cleaning equipment and tumbling mills.

Correction!

Apologies due! Through an oversight picture of **Leonard J. Mackell** was captioned **H. M. Richey** in our December, 1958, issue. The two gentlemen are pictured above. Announcement was made in the December issue of the election of **Herchel M. Richey** as Vice-President in Charge of Manufacturing, Roller Bearing and Rock Bit Divisions for Timken Roller Bearing Co., Canton, Ohio.

Leonard J. Mackell has been named Abrasive Engineer by Colonial Supply Co., Fort Pitt Blvd., Pittsburgh, to service grinding wheel and abrasive needs of industrial firms in the Pennsylvania, Ohio, Maryland, and West Virginia area. In business since 1911, Colonial is distributor for Bay State grinding wheels and Carborundum coated abrasive, in addition to a wide line of other industrial products.

ACCURACY .0002 T.I.R.

.0002 T.I.R. or less at Spindle Nose, .0005 T.I.R. or less on Test Arbor six inches from Spindle Nose

SPINDLE SPEEDS 150 and 250 RPM Other Spindle Speed Pulleys Available

MODEL B943 MOTOR DRIVEN WORK HEAD

No. 11 B & S Tapered Spindle Standard Equipment. No. 12 B & S or No. 5 Morse Available at Slight Extra Cost.

Clip ad to your letterhead and send for Literature

K. O. Lee Company, Aberdeen, S. D.

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In the manufacture of our "Micro-Graded" Aluminum Oxide Optical Powders, we accumulate large quantities of No. 400 and No. 500 Grit Precision Graded Aluminum Oxide Powders in excess of our normal requirements.

Additional outlets are required for these two grades as well as extremely fine Aluminum Oxide Powders below 5 microns in size.

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"MICRO-GRADED" ABRASIVES

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A complete line of Aluminum Oxide Powders from 2 to 50 microns available. Sized to your exact requirements.

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W. W. Tangeman

F. V. Geier

Cincinnati Milling Honors Tangeman

At the conclusion of the Board of Directors meeting held November 5, **Walter W. Tangeman,** having completed fifty years of service with The Cincinnati Milling Machine Co., retired as Chairman of the Board. His contribution to the company's growth and progress was gratefully acknowledged by the directors and officers at a dinner in his honor. He continues as a director.

Frederick V. Geier, President since 1934, was elected Chairman, with the responsibilities of Chief Executive Officer.

Swan E. Bergstrom, who joined the company in 1927, and has served as District Manager, Sales Manager, Machine Tool Division Manager, and since 1956 as Executive Vice-President, was elected President.

Henry J. Egen, Jr., is now Manager-Tool Engineering and Metal Fabrication for Philco Corp.'s (Phila.) Government and Industrial Division.

During the past 20 years, Egen has amassed considerable experience in engineering and manufacturing.

Steinberg Retires From Manhattan Rubber

William H. Steinberg, Technical Consultant and recently Sales Manager of the Abrasive Wheel Dept., retired after 41 years with the Manhattan Rubber Division of Raybestos-Manhattan, Inc., Passaic, N.J. He started as a development engineer in the Abrasive Wheel Dept. in 1917. Previously Steinberg had been with the Cutler-Hammer Co. in Milwaukee. He became Sales Manager for the Manhattan Rubber Division some time later.

Steinberg made probably his largest contribution to industry in connection with the development of Manhattan's line of the cut-off wheels.

Douglas E. Kellogg has been named Sales Manager of Foredom Electric Co., Inc., Bethel, Conn., manufacturers of flexible shaft machines, dental engines and percussion vibrators. He was with The Bristol Co. of Waterbury for ten years.

Rudy Cernick has joined the American Buff Co., Chicago, as Sales Representative in Eastern Michigan and Western Ohio.

S. E. Bergstrom

H. J. Egen, Jr.

Harry Parsons, who has represented the firm in Ohio and Western Pa. for the past three years, has been transferred to the New England territory. He will cover the states of Conn., R.I. and Mass. for the company.

Robert Hulland, formerly representative in Eastern Mich. for three years, will now cover Upstate New York and Eastern Ohio.

Glen Beckwith has joined the company as Sales Representative for the state of California. He was formerly with Metallon Products and Kwikset Locks.

R. C. Trow

R. J. Lickteig

Robert C. Trow has been elected Vice-President of King-Seeley Corp., Ann Arbor, Mich. He was formerly Assistant General Manager of the Queen Products Subsidiary of King-Seeley Corp. The appointment of the General Manager of the Queen Products Division and Vice-President of the parent company was made in connection with the liquidation of King-Seeley Corp's. wholly owned subsidiary, Queen Products, Inc., into Queen Products Division of King-Seeley Corp.

Robert J. Lickteig, formerly Sales Manager for the Scotsman Ice Machine line, has also been named Vice-President of the parent corporation. **Fayville A. Trow,** founder and former President of Queen, will continue with the Division for a time in a consulting capacity.

J. D. Rodgers and **R. A. Nederman** have been named Technical Service Representatives of Oakite Products, Inc., of New York, in Houston and Kansas City, respectively. Rodgers replaces **Ed Lacy** who retired recently after 37 years with Oakite. Both men have completed an intensive eight-week training course.

Benjamin M. Miller has been appointed to the position of Manufacturing Superintendent for the Armour and Co., Coated Abrasives Division, Alliance, Ohio. Miller has been associated with this Division in various capacities since 1925.

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TITLE

COMPANY

STREET

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Desmond-Stephan Mfg. Co.

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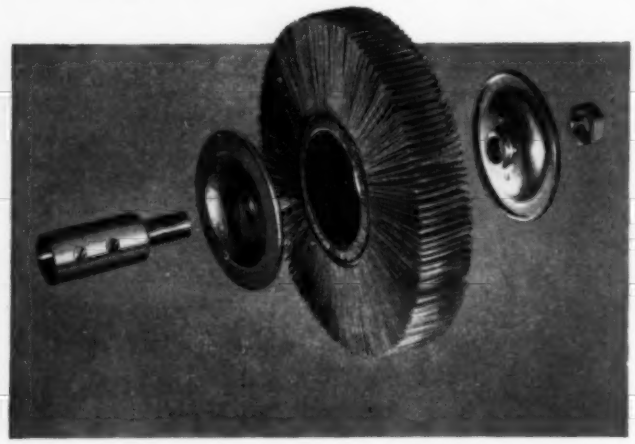
"the FLEXIBLE coated abrasive wheel"



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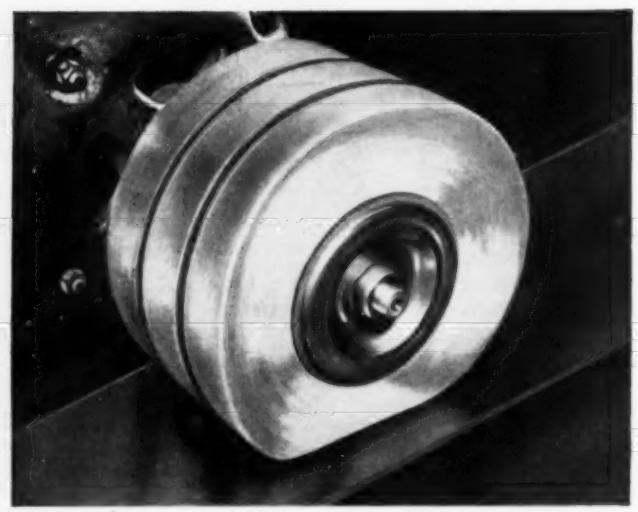
- *Requires no skill or experience to produce a perfect finish.*



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Manufacturers of SAND-O-FLEX & GRIND-O-FLEX abrasive tools

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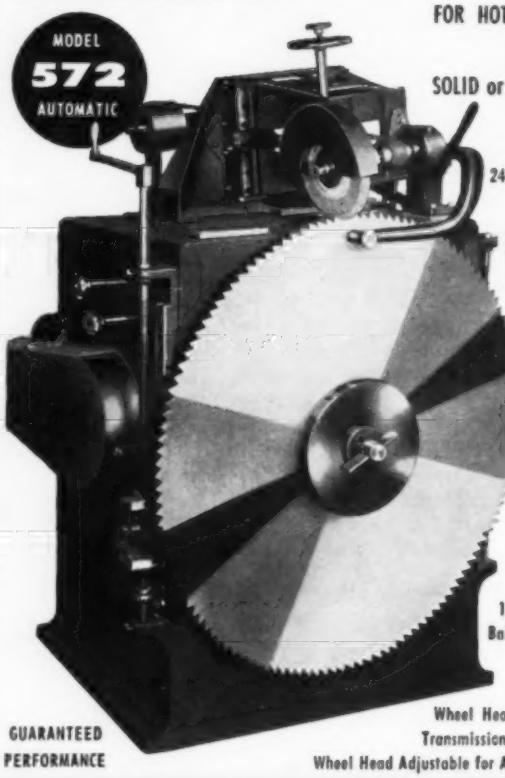
FOR HOT and COLD SAWS
TYPES
SOLID or INSERTED TOOTH

MODEL 572 AUTOMATIC



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24" to 72" and Larger

HEAVY DUTY
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100% Anti-Friction
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Wheel Head — 2 H.P. — 1800
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Wheel Head Adjustable for Any Saw Tooth Angle

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FIBRECOOL

THIS WATER-SOLUBLE CUTTING FLUID HAS EVERYTHING

FISKE'S FIBRECOOL will help you lower costs through heavier cuts, higher speeds and longer tool life. Produces better finishes in both cutting and grinding. It's "WORK PROVEN".

- TRANSPARENT, DOESN'T HIDE WORK
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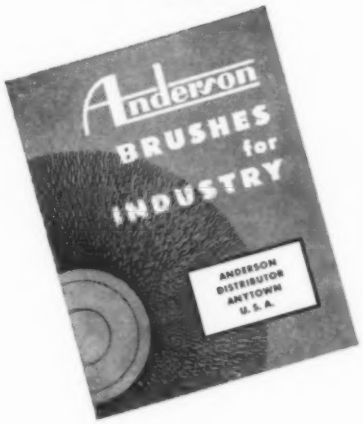
THE TOOL

THE TECHNIQUE



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Anderson

Write for complete catalog of wire brushes, with detailed selection and operation data.

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ANDERSON CORPORATION

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Worcester, Mass.

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M. E. Berglund

C. Sharp

R. N. Whitney

J. M. Stone

The Directors of The Torrington Co. of Torrington, Conn., elected **Water C. Thompson** Chairman of the Board. **Milton E. Berglund** was elected to the office of President, succeeding Thompson, with **Rodney T. Dunlap** elected Executive Vice-President.

Thompson, who has been a Director since 1946, joined the firm in 1927 and served successively as Secretary, Vice-President-Sales, and Executive Vice-President. He was elected President in 1953. Berglund has been a Director since 1947, and in 1955 was elected Executive Vice-President. Dunlap came to the company in 1940 and has been a Director since 1956, serving in other capacities also.

Colin Sharp has been named as the West Coast Manager of the Cutting Tool Division of Brown & Sharpe Manufacturing Co. of Providence, R.I. Sharp's background includes 25 years of experience in the cutting tool field from apprentice in the B & S training school to cutter engineering and through successive positions of responsibility in sales.

Robert N. Whitney, who for the past three years served as Assistant Purchasing Agent at Miniature Precision Bearings, Inc., Keene, N.H., has been appointed Purchasing Agent. He succeeds **Leo Vogel** who moved up to a newly-created position in MPB as Staff Assistant.

James M. Stone has been named Assistant General Manager of the Des Moines, Iowa, Division of Solar Aircraft Co., San Diego, Calif. He joined Solar in 1956 as Manager of Production Control, after service with the Crane Co. of Chicago.

William M. Harper has been appointed as Sales Engineer in the Cleveland district office of the Pangborn Corp., of Hagerstown, Md. Harper's headquarters are at 9802 Euclid Ave. in Cleveland. He has been previously associated with the Ford Motor Co. as a Plant Engineer in the Cleveland foundry.

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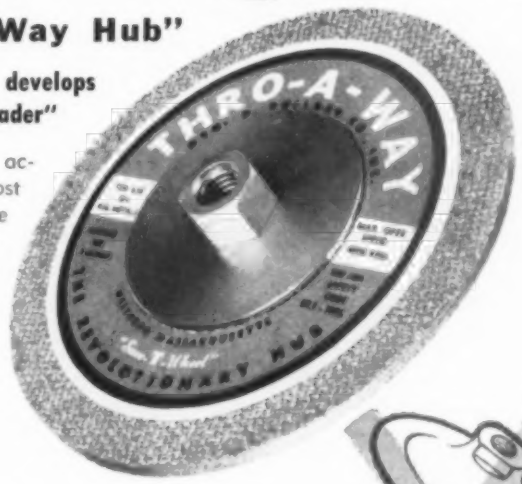
the "Throw-A-Way Hub"

The birth of an "idea" develops into an unchallenged "leader"

A design and construction accomplishment that insures cost reduction to small and large users — Performance outstanding.

The "Thro-A-Way" is **safer — ruggeder — faster.** Only one specification manufactured for metal removal. No inventory "build up problems".

For use on all right-angle grinders pneumatic or electric. Withstands greater peripheral speeds.



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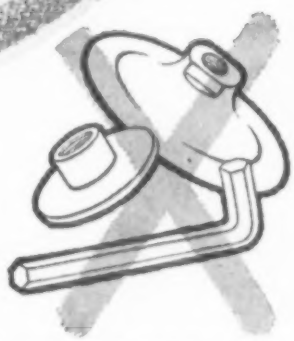

Geo. H. Bullard

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CUTS PRODUCTION COSTS AND SAVES YOU MONEY . . .

on any metalworking operation using coolants or cutting oils. Custom cleaning by impingement is a newly applied principle that increases production, improves work quality, reduces rejects, saves coolant and lengthens tool, wheel or abrasive belt life. Capacity ranges from 3 gpm to 1,000 gpm for a single machine or central system.

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- Diamond is pure—assuring faster cutting
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All orders for diamond compound now supplied in a free plastic throw-away applicator, in 5 gram and 18 gram sizes. Each applicator is color coded with grade shown; an air seal cap is provided for protection when not in use.

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Step up production of feather-edge sanding jobs or fine metal finishing with this lightweight Model 500-V vertical Airetool sander. Long handles make it easy to use . . . with maximum accuracy. Smooth-running, vibration-free pneumatic motor. Sturdy aluminum housing, rugged construction, precision-ground working parts. Uses 7" sanding disc; 2300, 3000 or 4000 rpm; weight: 4⅝ lbs. Call your Airetool representative or write us for Catalog No. 63 . . . describes complete line of Airetool pneumatic grinders, sanders, die grinders and drills.

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CANADIAN PLANT: Brantford, Ontario.

AIRETOOL MANUFACTURING COMPANY
SPRINGFIELD, OHIO

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Norton Co. Appointments

Norton Co. directors have elected **Donald L. Price** a Vice-President. Price, a veteran of 38 years in Norton sales positions, has been Sales Manager of Grinding Wheels for the Abrasive Division since 1955.

D. L. Price

R. Cushman

Robert Cushman, Manager of Marketing Services since 1958, succeeds Price as Sales Manager, Grinding Wheels.

Harry G. Brustlin, West Coast District Manager in Los Angeles, will return to the Worcester, Mass., main office of the company to succeed Cushman.

H. G. Brustlin

S. B. Wetherhead

Sidney B. Wetherhead has been appointed the company's Pacific Coast District Manager with headquarters at Los Angeles. He has been Manager, Distributor Sales.

Wilfred R. Ogg, Chicago District Manager of the Grinding Machine Division, becomes Manager of Distributor Sales for the Division.

W. R. Ogg

C. K. Kirk

Calvin K. Kirk will succeed Ogg as Chicago District Manager. **Thomas D. Bushman** has succeeded Kirk as Product Research Engineer.

Harry B. Randall, Jr., is the new District Manager of the Pratt & Whitney Co.'s New York office, succeeding **Joseph G. Brady** who is retiring from the company after 40 years' service. Randall will also head the company's branch office in Livingston, N.J.

Kenneth H. Connolly and **William A. Dinger** have been named to the post of Sales Supervisor of cutting tool and gage sales—Connolly in the New York area and Dinger in the New Jersey area.

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like a charm

Clover Coated Abrasives, like any other tools, really do no work at all by themselves; but they have a way of lasting, through use and abuse, that makes many a craftsman think of Clover as a partner.

There are good reasons for this lasting quality. First of all, every Clover Coated Abrasive is made to meet the standard of the best in its class. Second, the Clover line is complete—you can find a Clover Coated Abrasive item that is made for your job.

Ask for the new Clover Catalog to get acquainted with our full line of working-partner abrasives.

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Norwalk, Connecticut

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Since 1903

Makers of the famous
CLOVER Grinding and Lapping **COMPOUNDS**

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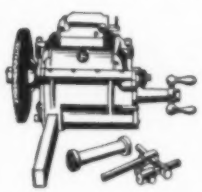
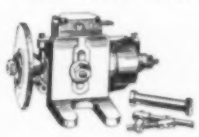
• **for FASTER . . . EASIER . . . MORE ECONOMICAL GRINDING**



TOOL POST GRINDER

VERTICAL SPINDLE GRINDER



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also special Motorized Spindles

GRINDING ATTACHMENTS

• *for lathes, planers, boring mills, milling machines, shapers, etc.*

Easily mounted for all supplementary grinding operations. For tool rooms and shops handling a wide variety and range of work from the simplest to the most complicated.

For internal and external grinding, grinding centers, reamers, taps, dies, rolls, journals, crankshafts, cylindrical, surface or special purpose grinding. With or without horizontal or vertical feeds.

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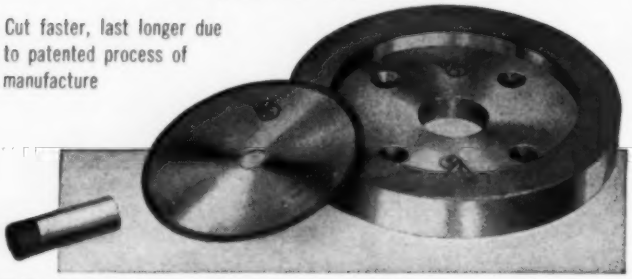
SINTERED STEEL BOND
DIAMOND WHEELS
(FOR WET GRINDING)

Cut faster, last longer due to patented process of manufacture



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In standard and special sizes and shapes for:

OPERATIONS	MATERIALS
Grinding	Sintered carbides
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Slicing, Dicing	Germanium, Silicon
Drilling	Glass, Quartz
Reaming	Marble, Granite
Generating	Ceramics, Porcelain
Pencil edging	Sapphire
Chamfering, Beveling	Boron carbide
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We specialize in NON-STANDARD requirements.
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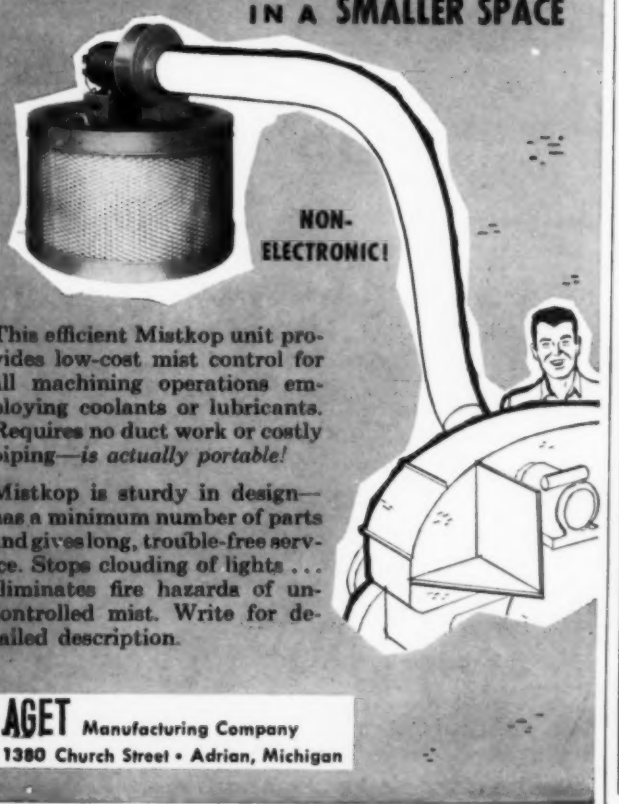
STOPS MIST
COLLECTS MIST-FOG EFFECTIVELY IN A SMALLER SPACE



This efficient Mistkop unit provides low-cost mist control for all machining operations employing coolants or lubricants. Requires no duct work or costly piping—*is actually portable!*

Mistkop is sturdy in design—has a minimum number of parts and gives long, trouble-free service. Stops clouding of lights . . . eliminates fire hazards of uncontrolled mist. Write for detailed description.

AGET Manufacturing Company
1380 Church Street • Adrian, Michigan
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H. B. Randall, Jr.

K. H. Connolly

W. A. Dinger

Randall joined the company in 1936 as a representative of the company's Kellerflex products. He became a sales engineer in 1946 and was assigned to the New York office in 1949 as a machine tool representative.

Leonard W. Wagner has been named Augusta District Manager for Pangborn Corp. of Hagerstown, Md., manufacturers of abrasives, blast cleaning and dust control equipment. In his new position, he will direct over-all sales activities and field engineering services from the district headquarters at 1317 Buena Vista Rd., Augusta, Ga.

Obituary

Verne E. Minich, 91 years of age, founder of Wheelabrator Corp., Mishawaka, Ind., and Honorary Chairman of the Board, died Dec. 13, in a New York City hospital.

Minich was with the Franklin Automobile Co. when he first heard about a sand cutter machine being made in Piqua, Ohio, by the Stockham Homogeneous Sand Mixer Co. Early in 1908 he took over the Piqua firm, starting a new company. In 1910 operations moved to Cleveland. Consolidations with other foundry equipment manufacturing plants followed until in 1926 the headquarters and plant of the firm was established in Mishawaka.

TO DIAMOND LAP CUTTING TOOLS, USE...
SPECTRUM
DIAMOND LAPPING WHEEL
(adaptable to all type grinders)
SPECTRUM DIAMOND LAPPING COMPOUNDS

Diamond lapped cutting tools increase production, provide better finishes, cut cooler, last longer. The fastest, most economical way to diamond lap tools is with SPECTRUM diamond lapping wheel and SPECTRUM diamond lapping compound.

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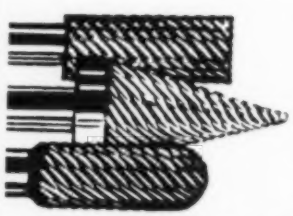

- Ground Cut Rotary Files for Soft Metals.
- Hand Chisel Cut for Hard Metals.
- Carbide Rotary Files.
- Salvage and Regrinding Service.
- Dealers Inquiries Invited.

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1328 58th STREET
BROOKLYN, 19, N. Y.
Use postpaid card. Circle No. 252

WALLS TU-WAY BELT SANDER

USE IT EITHER WAY

Full 1/3 h.p. G. E. Motor

At last, a top quality industrial sander that provides all the most wanted features — yet sells for so little. .

complete with cord, plug, switch ready to use **$89.95**

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New York and the HOTEL New Yorker 34th Street at 8th Ave. *just naturally go together*

New York's largest skyscraper hotel. 2500 rooms, all with bath and free radio—television in many. Meditation Chapel open to all faiths. Direct entrance to Pennsylvania Station. Facilities from 100 to 1200 for Banquets, meetings, etc. Three air-conditioned restaurants.

LAMP POST CORNER . . . COFFEE HOUSE
GOLDEN THREAD CAFE

from $7 Doubles from $11 Suites from $23

JOSEPH MASSAGLIA JR., President
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- LONG BEACH, CALIF. Hotel Wilton
- GALLUP, N.M. Hotel El Rancho
- ALBUQUERQUE, Hotel Franciscan
- DENVER, COLO. Hotel Park Lane
- WASHINGTON, D.C. Hotel Raleigh
- HARTFORD, CONN. Hotel Bond
- PITTSBURGH, PA. Hotel Sherwyn
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Teletype service—Family Plan

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R. M. Trent

G. S. Chiaramonte

Trent New Pangborn Pres.

Ralph M. Trent has been elected President of Pangborn Corp., Hagerstown, Md., manufacturers of Rotoblast, blast cleaning abrasives and dust control equipment. Another election was that of **Robert H. McCauley** as Director of the corporation. Both appointments fill the unexpired term of **Victor F. Stine,** recently deceased.

Trent has been associated with the corporation for 28 years. He was District Manager in Pittsburgh for 14 years and West Coast District Manager for 10 years. In Jan. 1957 he returned from the Pacific Coast organization to the home office to become Executive Vice-President.

George S. Chiaramonte has been appointed, by the Sheffield Corp. of Dayton, Ohio, as Sales Manager of its Cogsdill Twist Drill and Threadwell Tap & Die Divisions in Greenfield, Mass. For eleven years he was Sales Manager of The E. Horton & Sons Co., which later became the Horton Division of United-Greenfield Corp.

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ESBEC BARREL FINISHING CORP.
18 Beech St. Byram, Conn.

DEMONSTRABLY, the WORLD'S FINEST
DIAMOND WHEEL LINE
AVAILABLE IN
RESTRICTED TERRITORIES

We are seeking expanded distribution control in all key U.S. Industrial areas.

Box 22
Grinding & Finishing, Wheaton, Ill.

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Experienced filter or coolant representatives to handle new, unique, low cost magnetic coolant cleaner. Good commissions. Excellent opportunity.

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Wheaton, Illinois

- ACTUAL MANUFACTURERS OF RESINOID METAL AND VITRIFIED DIAMOND WHEELS UP TO AND INCLUDING 20" DIAMETERS

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Don't Miss these Features

GRINDING and FINISHING

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Laboratory and field tests compare man-made and natural diamonds.

28 Effects of Material on Snagging Wheel Performance
Active fillers are responsible for improved snagging wheels.

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Russians place greater emphasis on grinding.

37 Abrasive Wheels Cut "Chips"
High speed photos confirm and question theories.

38 Allis-Chalmers Uses New Diamond Dresser For Honing
Dressing and truing of stones reduces stone usage.

Coming Next Month

- **The Allis-Chalmers Portable Tool Control Program**
  Portable tools are perhaps the most widely misused of all grinders, from the standpoint of either efficiency or safety. This report of an airtool control program which has been in operation for nearly four years contains ideas of interest to every user of portable grinders, either air or electrical.

- **Surfacing Zirconium Alloy Sheets with Abrasive Belts**
  The problem was to produce on zirconium sheet an uncontaminated flat surface which would permit the sheets to be bonded satisfactorily by the gas-pressure bonding process. Its solution is a significant contribution to the much-too-scant published data on the grinding of this atomic-age metal.

- **"In Place" Roll Grinding**
  Roll grinding and its accompanying difficulties of machine down time and spare roll inventory are major factors in the maintenance budget of many companies. This is an account of an imaginative and ingenious device which could reduce such difficulties for many users.

- **The Case for "Built-In Guard" Cup Wheels**
  An objective report of a series of tests comparing cup wheels containing a one-piece prong bushing and safety back molded in, against conventional cup wheels reinforced with either a prong bushing or a steel ring.

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A GUARANTEE FOR YOUR CRYSTAL LAKE GRINDER

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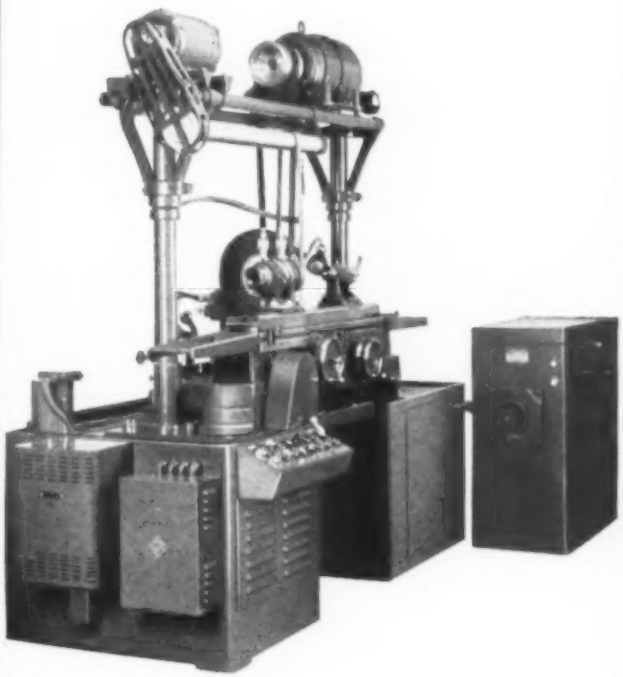
EASY OPERATION: CLOSE TOLERANCES:

ACCURACY: FINE MICROINCH SURFACE FINISH

A CRYSTAL LAKE GRINDER will hold size as well as grind round from .000005 to .000020" and finish from One to Four Microinch SURFACE FINISH. The essentials in grinding are a round spindle, taper bearings, a spindle that can be adjusted periodically without the squashing of bronze boxes and to have belt pressure ninety degrees from grinding pressure so the bronze boxes will not wear out of round.

For example, fuel injectors, after having been rough ground, can be ground to .000010" roundness with a sixty grit wheel and one pass of the wheel.



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Are You Handicapped by Experience?

Generally speaking, you're not. The majority of problems you solve correctly would have remained either insoluble or would have continued to plague you unless a rich background of varied and exacting experience had been at your beck and call. Let me not throw stones at the treasure house of experience. And yet, this same experience cannot only be an obstacle to progress, but can give you a real bloody nose. Against such a messy occurrence we must guard!

To too many men, experience is no more than doing today what was thought of yesterday, either in the same old way or in a slightly modified manner. But it's the same old answer, dictated by experience. When a new situation confronts them they dig deep to find a parallel. Man changes his ways slowly; he is loath to embrace new ideas. Experience has become a crutch and a comfortable old hat, ornamented with gay fishing flies which never tangled with anything bigger than a sunken stump. If experience is considered thus it is a definite handicap. If experience means no more than this-is-the-way-it's-always-been-done, it is not merely disastrous, but a gravestone.

We live in a jumpy age. We're like fleas on a hot stove. Technology changes so swiftly we're not quite certain which way to hop next; experience is not a stabilizer.

A Final Thought

We think of our changing world in terms of rockets and missiles. They are dramatic, but they are seemingly apart from the products we manufacture: toasters, flat irons and motors. And yet, technical changes extend even to toasters, flat irons and motors. Man-made diamonds, new casting processes, in-process gaging, etc. These improvements were made for you to explore, to use, to adopt to your special needs. Do not let a small, but strong voice say to you, "You've no experience with this, better go back to the old way."

There are times when experience must stay at home tending the fire while you venture into the dark alone. New methods must be tried, advantage must be taken of improved technical developments. In a way, you must become an adventurer, experience notwithstanding.

A few years ago castings were delivered with a quarter-inch overcoat of metal. Milling was the accepted, but laborious method, of hogging it off. Today, casting techniques permit accuracy to one-eighth of an inch, and grinding becomes almost mandatory. In a situation like this experience may not be of help in saving you money. It can be a handicap if it says to you, "This doesn't fit into our background at all, old boy. Let's put it back on a mill."

Be cautious of the sly whisperings of experience. Don't let it lead you down the garden path of we've-never-done-this-before. The black book of failure is filled with the stories of people who've had experience. Let experience be a servant, not a handicap.

Wm. J. Schleicher

Vice President & Editorial Director

STERLING'S

"Tailor Made"

Portable Grinding Wheels

BUILT TO PRE-DETERMINED FORMULAS TO MEET PORTABLE GRINDING DEMANDS

STERLING GRINDING WHEELS

"THE WHEELS OF INDUSTRY" STERLING

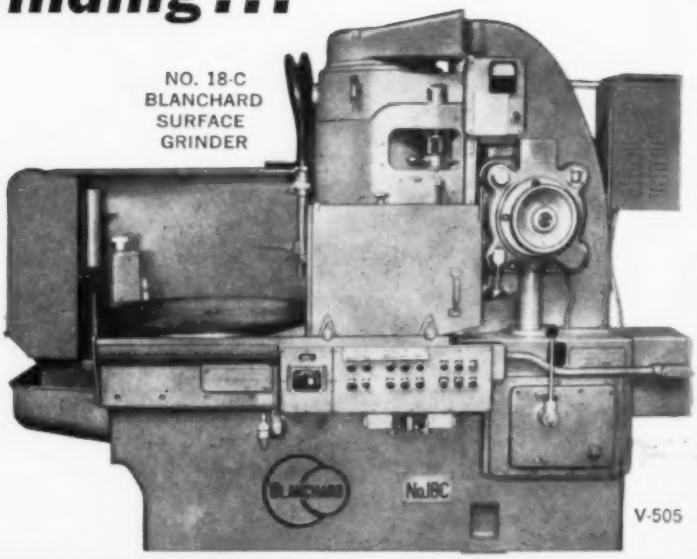
STERLING GRINDING WHEEL CO., TIFFIN, OHIO—SUBSIDIARY OF ABRASIVE AND METAL PRODUCTS COMPANY

Distributors and Direct Representatives Located in All Principal Cities

PRE-TESTED TO YOUR SPECIAL NEEDS

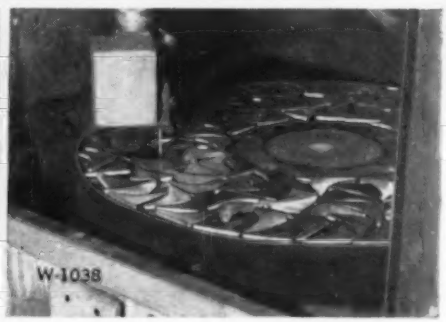
For better, easier grinding...

Whether you're "hogging" off stock from rough castings or precision grinding to a tolerance of ±.0005", you can do it better and easier with the Blanchard No. 18-C Surface Grinder. Once the work is set up, the automatic cycle handles every operation from start to finish. The operator is free to prepare the next load of work or to operate a second No. 18-C Grinder.



Cast Iron Plate. Blanchard ground at the rate of 30 pieces – 60 surfaces – per hour. Stock removal ⅛" each side.

Steel Bars. Blanchard ground at the rate of 48 pieces – 192 surfaces – per hour. Stock .040"-.045" from each side. Limits ±.001" square, flat and parallel.



Hot Rolled Steel Cams. One operator and one No. 18-C Blanchard produce 225 pieces – 450 surfaces – per hour. Stock removal 1/32" each side. Limits ±.001".

just push a button...

- Automatic size control to ±.0005"
- Duplication of repetitive loads
- Pre-set "spark out" time for flatness and surface finish
- No more "operator worry" on close work – greatly reduced fatigue
- A large part of operator's time available for
  - (a) Handling or slushing work pieces
  - (b) Filing burrs
  - (c) Selecting correct wheel and preparing for next job
- Specially-designed sizing device with built-in feature to compensate – automatically – for wheel wear during grinding cycle.

All of these features give you *more efficiency at reduced costs!*

PUT IT ON THE BLANCHARD

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